'INTUITIVE ARITHMETIC,

THE

READIEST AND MOST CONCISE METHOD OF CALCULATION EVER PUBLISHED,

DESIGNED

FOR THE USE OF ALL CLASSES,

UNDER THE SPECIAL

PATRONAGE OF HER MOST GRACIOUS MAJESTY THE QUEEN,

BY

DANIEL O'GORMAN,

TEACHER, DURHAM.

SECOND EDITION,

GREATLY ENLARGED, WITH THE GROUND-WORK OF A MECHANICAL AND MERCANTILE EDUCATION, JUDICIOUSLY ARRANGED.

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THE QUEEN'S APPROBATION AND PATRONAGE OF THE WORK.

On receipt of a copy of the work, Her Majesty was pleased to make the following gracious reply :—

"Miss Skenett begs to inform Mr. O'Gorman, that Her Majesty re-
"ceived the Arithmetic Book which he sent. *H.M. thinks it is a book*
"*likely to be of great service in teaching ready calculations.*
"Her Majesty was graciously pleased to accept of the copy.
"*Buckingham Palace, 7th Feb.*, 1846."
"Mr. D. O'Gorman, Teacher, Durham."

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TO HIS ROYAL HIGHNESS
FRANCIS ALBERT AUGUSTUS CHARLES
EMANUEL, DUKE OF SAXE, PRINCE OF SAXE
COBURG AND GOTHA, KNIGHT
OF THE MOST NOBLE ORDER OF THE
GARTER, &c. &c.

MOST NOBLE PRINCE,

ALL who know any thing of your exalted station, your many virtues, and your truly estimable character, will admit, that I could not choose a more Excellent Patron, under whose fostering protection I might publish the following work, than your Eminence, who has distinguished yourself in the most considerable instances as a Gentleman of a generous and public spirit; a lover and promoter of every thing which appears useful for cultivating the Arts and Sciences, advancing the good of Mankind, or which may contribute more to the honor and prosperity of the English Nation.

The encouragement of your Highness in the cultivation of modern Arts and Science, and the constancy and resolution with which you lend your powerful aid in supporting projects for promoting the interests of the English People, are evidences of a good and benevolent disposition, as your admired and celebrated conduct in the more public scenes of action, is, of a mind possessed with a passion for things truly great and noble.

As every thing appears with a peculiar advantage under your countenance and approbation, so I persuade myself that this Treatise will meet with the greater regard, and be more favourably received by the public, by having it dedicated to your Serene Highness.

But I know, Most Noble Prince, the respect I now pay you is offering a kind of violence to one, who has always been as solicitous to shun applause, as careful to deserve it. Therefore, to your Royal Highness, from whom the Arts and Sciences derive lessons of taste and refinement, I humbly beg leave to dedicate this little volume, and to shew how much I am in duty, as well as obligation,

Most Noble Prince,

Your Royal Highness'

Most obedient and humble Servant,

DANIEL O'GORMAN.

INTRODUCTION.

As the common Arithmetics of the day contain much matter with which there is no absolute necessity that every pupil should make himself acquainted, and as these works generally fall into the hands of those who have neither time to waste nor opportunity to avail themselves; this work indiscriminately is intended to assist the young student in the groundwork of ready and useful calculations, as well as the practice. We have therefore carefully studied what course should be laid down in a matter of such importance, and we trust the precepts and examples will be found to suit the object, viz.; the rapid improvement and easy access of the pupil to ready calculation, and our own character depending thereon. We trust that in the following treatise such a system of science and practice shall be found, that our subscribers and readers never met with anything more suitable to their avocations and wants. We purpose in the following sheets to lay down such rules and principles and short methods, that every schoolboy, and those of the most dull apprehensions shall receive such benefit and instruction, as no other work on the subject can afford. After our young friend has made himself master of numeration and its dependent principles, we then recommend to his most serious perusal, the definitions and tables in the first part of the work; these, if properly attended to, will serve him in the whole course of his studies: many excellent accountants have been wandering in the dark, merely through want of such assistance. If the pupil's time and genius afford the opportunity of committing to memory our demonstrations, so much the more will he profit; but if these favourable circumstances occur not, then let him carefully attend to the tables; and we assert roundly, so complete a set of tables, coins, weights, and measures, were never before published. A perfect knowledge of these tables will serve every student, be his intended profession what it may. In the whole, the contractions will be found of the greatest importance, and the pupil, therefore, according to his ability and taste should attend to them

closely, and make it his study never to pass over any rule without knowing its meaning, nor dwell too long in any case perfectly understood.

Surely short and easy methods in accounts give the pre-eminence, and indisputably this system contains more thereof than any other ever before published. The simple rules are laid down in a manner not hitherto given by any author, and what is commonly called *Long Division*—a rule occupying so much time and difficulty to the learner, and trouble to the teacher, is illustrated by examples, showing the quotient in one line at the bottom like short Division: thus saving much time and labour to both master and scholar. In the compound rules will be found many useful hints and methods, entirely suited to the business of the day, and well worthy of perusal and these methods, when fully understood by the pupil, will qualify him to pass through the general routine of business, with that adroitness and facility which every one aspiring to become a good accountant should make his principal object.

From these general observations on the work, we apprehend our readers will be better qualified to go through the same than if left entirely to their own judgment. True indeed, the work speaks for itself; but still we think there is an absolute necessity in pointing out the improvements and original excellencies in which we think our system exceeds others, in order to direct the attention more fully to those beauties so necessary both in theory and practice.

We hope that the judicious teacher who has his pupil's interest at heart, will carefully direct him to study these short rules and methods with the most ardent attention, and that neither prejudice nor long contracted habits will prevent him from at once introducing a method that will be creditable to himself and beneficial to the youth committed to his care. These he must see will assist the pupil in his ordinary concerns in after life, and in the mean time, give him a taste for proficiency in numbers, that nothing but such brevity of system could produce.

Teachers, we hope, will find this work of the greatest importance to themselves and scholars; the number of examples suited

to all ranks and professions, with the shortest methods possible of solution, and the whole deduced from rational principles, will leave nothing wanting for their use and information.

The tables of exchange are copiously given at the end of the work, comprising the coins of the known world, with their English value, as ascertained correctly at the London Mint: this will also be found to be of the greatest utility to merchants and traders, who reside in the seaport towns, and who transact business with foreign nations. In fact neither labour nor expense has been spared to render this work worthy of the highest patronage that Royalty could bestow, and with which it has been honored on its first appearance, nor anything left undone to render the free accession of the present Edition admissible into every counting house, office, chamber, and school in the United Kingdom. The Author, therefore calculates on the generous support of an enlightened public, and if nothing else accrue but the diffusion of his plan of ready calculation throughout the rising generation, he rests quite satisfied the public will benefit by it, and he will have attained his object.

Hallgarth Street School, Durham, 7th Feb., 1847.

THE AUTHOR, to prevent fraud, offers a reward of one hundred pounds to any one who will give information against any person or persons who will attempt to print or publish this work without his approbation, under his hand and seal in writing, first obtained, agreeable to the Act of Parliament in that case, made and provided. Also, a further reward of fifty pounds to any person who has taken out of this work the number of pages specified in said Act. And a further reward of thirty pounds will be given to any person who will give such private information as may lead to a discovery of the offender, and his name shall be kept private.

DANIEL O'GORMAN.

Hallgarth Street School, Durham, 7th February, 1847.

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ARITHMETICAL SIGNS AND MARKS.

\+ Plus, or Addition.
— Minus, Less, or Subtraction.
× Multiplication.
÷ Division.
= Equality.
$\surd$ Square Root of any number over which it is placed, as $\surd \overline{4,9}$ the Square Root of 49, or $\surd^{3}$ Cube Root, $\surd^{4}$ Biquadrate, &c.
:: Proportion.
∴ Therefore, ⊏ Greater than, ⊐ Less than, ∠ an angle; □ Square, △ Triangle.
∺ Geometrical proportion, or progression.
± It is a doubtful sign, signifying Plus or Minus.

INTUITIVE ARITHMETIC.

CHAPTER I.

DEFINITIONS.

1. ARITHMETIC is a science which teaches the relation of numbers one to another, and by them deduces precepts of computation relative to the affairs of the busy part of mankind. And, in reality, there are but two primary operations, from which the rest are all branches; viz., Addition and Subtraction, as will be clearly demonstrated. For Multiplication is but a contracted method of Addition, and Division a contracted mode of Subtraction.

2. The most part of the objects of our knowledge may be calculated as being capable of augmentation and diminution; and, our ideas of things, as far as they have that tendency, is what we call quantity, by which word may be comprehended whatever can properly be said to have parts. Under this definition we may class extension, weight, motion, time, &c. The one being taken, greater or less, heavier or lighter, swifter or slower, in proportion to one another of the same kind; and, since the primary property of quantity is the being capable of more or less, quantities may be added to, subtracted from, or multiplied by one another, and consequently divided into the parts they contain.

3. Unity is that by which every thing that is called one, is considered. Unity is the beginning of every number.

4. Number is many composed of units.

5. A number is said to measure another, when the lesser being taken a number of times, is exactly equal to the greater, as 8 measureth 24, because 3 times 8 make 24. Unity measureth all numbers.

6. One number is a multiple of another, when the less measureth the greater, or when the greater containeth the less a number of times exactly.

7. An aliquot part of a number is that which measureth the said number without a remainder. The number 2 is an aliquot part of 10, being taken 5 times; but 3 is an aliquant part of 10, because it does not measure 10 without a remainder. Therefore any number that measures another number without a remainder, is called an aliquot number; and any number that does not exactly measure another number, is called an aliquant number.

8. Numbers consist of digits, articles, compounds, whole, broken, mixed, &c.

9. Numbers are equal, unequal, even, odd, evenly even, evenly odd, oddly odd, composite, plain, solid, perfect, harmonic, square, cube, &c., &c.

10. Equal numbers are such as contain an equal number of units.

11. Unequal numbers are those whose number of units differ.

12. An even number is that which may be divided into two equal parts.

13. An odd number is that which cannot be divided into two equal parts.

14. A number evenly even, is that which an even number measureth by an even number: such is 24, which is the even number 6 measured by the even number 4.

15. A number evenly odd, is that which an even number measureth by an odd number: such is 12, when the even number 4 measures by the odd number 3.

16. A number oddly odd, is that which an odd number measureth by an odd number: such is 21, which an odd number 7 measureth by an odd number 3.

17. A composite number is that which some certain number besides an unit measureth, and consequently hath several aliquot parts: such are 4, 6, 8, 9, 10, 12, 14, 16, and infinite others.

18. Plain numbers are such as are made of the multiplication of two, as 6×2 is 12.

19. A solid number is that which is produced from the multiplication of three numbers, and the numbers that multiply one another are called the sides of the solid number: consequently every solid number is composite; 24 is a solid number, because it is made by the multiplication of three numbers, 2, 3, and 4, for $2\times3=6$ and $6\times4=24$.

20. Perfect numbers are such, whose aliquot parts added together are equal* to themselves; as 6, whose parts are 3, 2, 1,=6; the second perfect number is 28, for all the aliquot parts thereof are 1, 2, 4, 7, 14, which added together make 28.

21. Harmonic numbers are such, that the aliquot parts of the one collected, are equal to those of the other number.

*If a series of numbers continually proportional from unity in a duplicate ratio, be continued until their sum be a prime number, the sum being multiplied into the greatest term shall produce a perfect number.

Hence, by the above, may be found all the perfect numbers; because the sums of 1 and 2 are 3, a prime number, $3\times2=6$ the first perfect number, whose aliquot parts are 1, 2, and 3; and because the sums of 1, 2, and 4, are 7 a prime number, 7 multiplied by the greatest aliquot part 4, make 28, the second perfect number whose aliquot parts are 1, 2, 7 and 14.

Again, the sums of 1, 2, 4, 8, and 16, are 31, a prime number=$31\times16=496$ the third perfect number; the aliquot of the next are 1, 2, 4, 8, 16, 31, 62, 124, 248.

22. A square number is that which is made by the multiplication of two equal numbers, or by the multiplication of any number by itself, which is called a square root. The first square in whole numbers is 4, which is made by multiplying 2 into itself; the second is 9, which is found by 3×3 and so on to infinity.

23. A cube number is that which is made by the multiplication of three equal numbers, the number itself is called a cube root. The first cube except 1 is 8, which is found by the multiplication of 2 thrice taken, $2\times2=4$ and $4\times2=8$. The second is 27, which is made by the multiplication of 3 taken thrice, as $3\times3=9$ and $9\times3=27$.

24. In numbers the ratio or proportion, is the mutual habitude of two numbers to one another, and is two fold, either in respect of quantity or quality. In respect of quantity, it is considered between two numbers, the first called the antecedent, the second the consequent, and is equal, as 3 to 3, or unequal, as the greater to the less, 6 to 4, or the less to the greater, as 4 to 6.

In respect of quality, which is a similitude of reasons called proportion, it is considered between more than two numbers; for though the reason of two numbers may be had as before, yet a similitude of reasons cannot be found, unless the numbers be more than two, and is threefold. First, in respect of their difference; second, of their quote; third, in respect of both.

Of the first, ariseth Arithmetical proportion; of the second, Geometrical proportion; of the third, harmonical proportion.

A Theorem is a proposition whose truth is to be demonstrated.

A Problem is a proposition of something to be done or discovered.

A Lemma is a theorem instructive to some subsequent proposition, to shorten the proof or practice of it.

A Corollary is a proposition gained in consequence of another, whose truth is evident, from the truth or demonstration of the former.

A Demonstration is an infallible proof of the truth or falsity of propositions.

AXIOMS.

1. These things which are equal to the same thing are equal to one another.
2. If equal things be added to equals, the whole shall be equal.
3. If equals be taken from equals, the remainders shall be equal.
4. If equals be multiplied by equals, the products shall be equal.
5. If equals be divided by equals, the quotients shall be equal.
6. The whole is equal to all its parts.

A Postulate is something granted on which to found a proof.

An Axiom is a proposition whose truth is self-evident.

A Proposition is whatever is affixed or proposed either as matter of assent, practice, or speculation.

Propositions are divided into Theorems, Problems, Lemmas, and Corollaries.

Numeration is the first principal part of Arithmetic, and teaches how to read, write, value, or express any number of figures, and consists of two parts.

1. The due order of setting down figures.
2. The value of each figure in its proper place.

Notation and Numeration Tables.

PLACE.												
*1st. Units	1	21	321	4321	54321	654321	7654321					
2nd. Tens		2	32	432	5432	65432	765432					
3rd. Hundreds			3	43	543	6543	76543					
4th. Thousands				4	54	654	7654					
5th. Tens of Thousands					5	65	765					
6th. Hundreds of Thousands						6	76					
7th. Millions							7					
8th. Tens of Millions								1	21	321	4321	54321
9th. Hundreds of Millions									2	32	432	5432
10th. Thousands of Millions										3	43	543
11th. Tens of Thousands of Millions											4	54
12th. Hundreds of Thousands of Millions												5
13th. Billions, or Millions of Millions								1	21	321	4321	54321
14th. Tens of Billions									2	32	432	5432
15th. Hundreds of Billions										3	43	543
16th. Thousands of Billions											4	54
17th. Tens of Thousands of Billions												5
18th. Hundreds of Thousands of Billions												6
19th. Trillions								1	21	321	4321	54321
20th. Tens of Trillions									2	32	432	5432
21st. Hundreds of Trillions										3	43	543
22nd. Thousands of Trillions											4	54
23rd. Tens of Thousands of Trillions												5
24th. Hundreds of Thousands of Trillions												6
25th. Quadrillions												7

* The first period is called Units, the 2nd. Millions, the 3rd. Billions, the 4th. Trillions, the 5th. Quadrillions, &c., and so on to Quintillions, Sextillions, Septillions, Octillions, &c., and when the Pupil can read one period well, he may read any length of figures whatever

Notation by Letters.

I.	One	XII.	Twelve	L.	Fifty
II.	Two	XIII.	Thirteen	C.	One Hundred
III.	Three	XIV.	Fourteen	D.	Five Hundred
IV.	Four	XV.	Fifteen	DC.	Six Hundred
V.	Five	XVI.	Sixteen	M.	One Thousand
VI.	Six	XVII.	Seventeen	$\overline{V}$.	Five Thousand
VII.	Seven	XVIII.	Eighteen	$\overline{X}$.	Ten Thousand
VIII.	Eight	XIX.	Nineteen	$\overline{L}$.	Fifty Thousand
IX.	Nine	XX.	Twenty	$\overline{C}$.	One Hundred Th.
X.	Ten	XXX.	Thirty	$\overline{D}$.	Five Thousand
XI.	Eleven	XL.	Forty	$\overline{M}$.	One Million

CHAPTER II.

Addition of whole numbers is the second essential part of Arithmetic, and teaches, of several numbers of the same denomination to make one total, called their sum.

RULE. Set down all the numbers to be added, as in the following examples; but observe to set no figure in the same column, that is not of the same value, or place, and draw a line under them.

2. Begin at the place of units, add up that column, and find how many tens are contained therein.

3. Set down what remains above the tens, or if nothing remains, write down a cipher, and carry* as many ones to the next column as there were tens in this.

4. Proceed with the second column in like manner, and so on till all be finished.

Examples.

1.

7	8	6	3	7	4	
1	4	2	1	5	3	
5	3	2	1	6	2	
4	7	8	6	4	5	
6	3	2	4	2	1	
25	7	1	7	5	5	Sum
17	8	5	3	8	1	
†25	7	1	7	5	5	Proof

2.

2	4	5	6	7	
3	5	8	4	2	
5	6	4	2	3	
7	5	8	6	2	
3	8	6	7	5	
23	1	3	6	9	Sum
20	6	8	0	2	
23	1	3	6	9	Proof

**Reason for carrying one for every ten.* Because ten units in the first column towards the right hand, make an unit in the next row towards the left; therefore, the reason of carrying one for every ten is evident, and the method of placing the figures is no less evident, because any other arrangement of them would alter their value. This rule is founded on the known axiom "the whole is equal to all its parts."

†*Method of Proof.* First, draw a line below the uppermost number,

3.

4	7	8	6	7	
6	6	4	3	2	
7	4	8	3	4	
5	2	3	4	2	
3	7	6	5	6	
27	9	1	3	1	Sum
23	1	2	6	4	
27	9	1	3	1	Proof

4.

5	4	7	6	3	
8	6	5	4	2	
7	6	4	8	3	
4	2	8	6	5	
9	8	7	5	2	
35	9	4	0	5	Sum
30	4	6	4	2	
35	9	4	0	5	Proof

A new and expeditious method for the use of teachers in large Schools.

In setting the question for the pupil, arrange it so, that every two lines in the column beginning at units place will exactly make ten, and in the place of tens in the second column, let every two lines in the setting down make nine, and so on with all the rest. The key line may be put down at pleasure, either at top, bottom, or in the middle, so that the master will at one view see the correctness of the addition without the trouble of totting.

Examples.

5.

4	7	6	5	3	8	
5	2	3	4	6	2	
7	5	4	6	3	4	
2	4	5	3	6	6	
8	6	4	7	8	3	
1	3	5	2	1	7	
4	8	3	7	6	2	
5	1	6	2	3	8	
1	2	3	4	5	6	Key line
41	2	3	4	5	6	

6.

7	8	6	4	7	5	
2	1	3	5	2	5	
3	7	8	6	5	4	
6	2	1	3	4	6	
8	3	4	2	7	8	Key line
7	6	3	4	2	1	
2	3	6	5	7	9	
4	2	3	4	5	6	
5	7	6	5	4	4	
48	3	4	2	7	8	

7.

1	2	5	6	3	4	Key line
7	8	6	5	4	3	
2	1	3	4	5	7	
3	4	5	2	4	1	
6	5	4	7	5	9	
7	8	6	5	4	2	
2	1	3	4	5	8	
3	7	8	6	4	5	
6	2	1	3	5	5	
41	2	5	6	3	4	

8.

4	5	8	3	4	2	
5	4	1	6	5	8	
7	8	6	4	2	3	
2	1	3	5	7	7	
6	2	5	4	8	3	
3	7	4	5	1	7	
8	4	3	4	7	8	
1	5	6	5	2	2	
1	0	0	0	0	3	Key line
41	0	0	0	0	3	

and suppose it cut off; second, add all the rest together, and set their sum under the number to be proved; third, add the last line found to the uppermost line cut off, and if the sum be the same as that found by the first addition, the work is right.

The foregoing plan may be generally applied in addition of whole numbers, and enough has been said to render it explanatory to any capacity.

The Use.

1. A merchant on settling his accounts finds he owes A. 60*l.*, B. 150*l.*, C. 240*l.*, and to D. 100*l.* I require to know how much he owes in all? *Ans.* 550*l.*

2. A merchant is indebted to A. 4600*l.*, to B., 370*l.* to C. 6000*l.*, to D. 1267*l.*, to E., 7640*l.*, to F. 60*l.*, what sum did he owe in all? *Ans.* 19937*l.*

3. A man born in the year 1846, when will he be sixty years old? *Ans.* 1906.

4. A merchant receives the following sums, 200*l.*, 317*l.*, 315*l.*, 10*l.*, 172*l.*, 513*l.*, and 9*l.*. what is the whole sum? *Ans.* 1536*l.*

5. What is the weight of seven casks of merchandise, viz., No. 1, weighing 960 lbs.; No. 2, 725 lbs.; No. 3, 830 lbs.; No. 4, 798 lbs.; No. 5, 697 lbs.; No. 6, 569 lbs.; and No. 7, 987 lbs.? *Ans.* 5566 lbs.

6. A. borrowed from B. a sum of money, and paid in part, 302*l.*, and the remainder is 30*l.*, what sum did A. borrow? *Ans.* 332*l.*

7. At the custom house, Sunderland, on the 1st. of May, were entered 1200 lbs. of Tea; on the 16th, 1479 lbs.; on the day following, 1941 lbs.; the same day, 6195 lbs.; on the four last days of the same month, 1236 lbs., each day; how many pounds were entered during the month? *Ans.* 15759 lbs.

8. An army consisting of 4000 foot soldiers, 4006 cavalry, 3093 light infantry, 1224 gunners, 1400 pioneers, and 200 miners, required the number of the whole army? *Ans.* 13923 men.

9. What interval of time will elapse between a transaction that happened 60 years ago, and one that may happen 100 years hence? *Ans.* 160 years.

10. In the present year 1846, the value of goods exported to America was fifty-nine thousand, six hundred and seventy-eight pounds; to China, one hundred and nine thousand nine hundred pounds; to Australia, one million seventy-eight thousand and seven hundred and thirty-one pounds; to India, six hundred sixty-seven thousand one hundred and one pounds; to St. John's, one million six hundred, two thousand nine hundred and twenty-four pounds; and to Spain, one million, eight hundred and eleven thousand, two hundred and sixty-eight pounds; required the amount exported? *Ans.* 5329602*l.*

CHAPTER III.

SIMPLE SUBTRACTION.

Subtraction is the finding how much one single number exceeds another, or the taking a less number from a greater. The remainder is called the difference.

RULE.—Write down the figure's units under units, and tens under tens, placing the greater uppermost; begin at the unit's place and take the difference between it and the figure above it, which difference write down for the remainder, if the figure below be greater than the figure above, add ten,* and then subtract, carrying one for every ten so added throughout.

Examples.

	1.	2.	3.	4.	5.
From	4763	8765	7812	9782	4764238
Take	3584	1234	5843	5476	4598769
Rem.	1179				
Proof	4763				

Application.

1. Suppose A. was born in the year 1824, and B. in the year 1846, what is the difference of their ages? *Ans.* 22 years.

2. There are two numbers, the greater is 1795, and the difference 1695, what is the lesser number? *Ans.* 100.

3. I had lent my friend 419*l.*, and he died 403*l.* in my debt, how much did he pay me? *Ans.* 16*l.*

4. Bought 14 cwt. of tobacco for 1540*0l.*, and sold 8 cwt. for 8800*l.*, how many hundred have I on hands, and what sum do I want to make first cost? *Ans.* 6 cwt. and 6600*l.* deficiency.

5. In 5 bags were different sums of money amounting to 1000*l.*, In the first 100*l.*, in the second 314*l.*, in the third 143*l.*, and in the fourth 209*l.*, what did the fifth contain? *Ans.* 234*l.*

6. John Henry Quinn, Esq., of Dromore House, has an estate worth 1600*l.* a year, he pays land tax 150*l.* and quit-rent 65*l.*, what is his neat estate worth per annum? *Ans.* 1385*l.*

*The ten which is added by the rule is the value of an unit in the next place, by the nature of Notation; the one which is added to the next place of the lesser number, diminishes the correspondent place of the greater; so that it is only taking from one and adding so much to another, which never changes the Total.

CHAPTER IV.

Multiplication and Division Tables on an improved plan.

2 ×	2 · | ·	3 ×	3 · | ·	4 ×	4 · | ·	5 ×	5 · | ·	6 ×	6 · | ·	7 ×	7 · | ·	8 ×	8 · | ·	9 ×	9 · | ·
2	4	2	6	2	8	2	10	2	12	2	14	2	16	2	18
3	6	3	9	3	12	3	15	3	18	3	21	3	24	3	27
4	8	4	12	4	16	4	20	4	24	4	28	4	32	4	36
5	10	5	15	5	20	5	25	5	30	5	35	5	40	5	45
6	12	6	18	6	24	6	30	6	36	6	42	6	48	6	54
7	14	7	21	7	28	7	35	7	42	7	49	7	56	7	63
8	16	8	24	8	32	8	40	8	48	8	56	8	64	8	72
9	18	9	27	9	36	9	45	9	54	9	63	9	72	9	81
10	20	10	30	10	40	10	50	10	60	10	70	10	80	10	90
11	22	11	33	11	44	11	55	11	66	11	77	11	88	11	99
12	24	12	36	12	48	12	60	12	72	12	84	12	96	12	108

10 ×	10 · | ·	10 ×	10 · | ·	11 ×	11 · | ·	11 ×	11 · | ·	12 ×	12 · | ·	12 ×	12 · | ·
2	20	8	80	2	22	8	88	2	24	8	96
3	30	9	90	3	33	9	99	3	36	9	108
4	40	10	100	4	44	10	110	4	48	10	120
5	50	11	110	5	55	11	121	5	60	11	132
6	60	12	120	6	66	12	132	6	72	12	144
7	70			7	77			7	84		

SIMPLE MULTIPLICATION.

Multiplication of whole numbers, is a manifold addition, or the repeating a given quantity as often as required.

The number to be multiplied is called the multiplicand.

The number we multiply by is called the multiplier.

The number found is called the product.

RULE. Place the multiplier under the multiplicand, units under units, and tens under tens; draw a line and multiply every figure in the multiplicand by each figure in the multiplier, observing to carry for the tens, add all into one sum for the product. *The Reason* of placing the figure as directed is evident from the nature of Numeration.

☞ *Proof by the peculiar property of the number* 9. Add all the digits of the multiplicand, rejecting the excess of nines, which place to the left

Examples.

CASE 1.

When the multiplier is any figure from 2 *to* 12, *proceed thus :—*

1. Multiply 34678946 by 2

2

69357892 *Ans.*

2. Multiply 67865431 by 7

7

475058017 *Ans.*

3. Multiply 374328756432 by 3. *Ans.* 1122986269296.
4. Multiply 5806342748 by 4. *Ans.* 23225370992.
5. Multiply 8435674 by 5. *Ans.* 42178370.
6. Multiply 274567546 by 6. *Ans.* 1447405276.
7. Multiply 54328432 by 8. *Ans.* 434627456.
8. Multiply 8643597 by 9. *Ans.* 77792373.
9. Multiply 79865342 by 11. *Ans.* 878518762.

CASE 2.

When the multiplier is a composite number.

RULE. Multiply by the component parts, for example.

1. Multiply 376 by 21

3

1128

7

7896 *Ans.*

2. Multiply 98765432 by 32

4

395061728

8

3160493824 *Ans.*

3. Multiply 9378964 by 42. *Ans.* 393916488.
4. Multiply 87698745 by 54. *Ans.* 4735732230.

CASE 3.

If your multiplier be between 10 *and* 20.

RULE. Multiply each figure in the multiplicand by the units of the multiplier, adding to each product its own back figure, and to the last figure add the tens, if any.

Examples.

5. Mul.	385	6. 679	7. 4873	8. 6958	9. 7956	10. 7685
by	13	16	18	17	15	19
	5005	10864	87714	118286	119340	146015

hand of the cross; do in like manner with the multiplier, placing the excess of nines to the right hand of the cross. Multiply those two sums, setting the excess of nines to the top of the cross. Reject the nines in the product of these two sums, placing it underneath, and if the excess of nines in the product, be equal to the excess of nines in the multiplicand and multiplier, the work is right.

If the multiplier be between 20 *and* 30.

RULE. Multiply as above and take the back figure double, add the tens to the last figure doubled.

Examples.

1. Mul.	798	2. 567	3. 395	4. 487	5. 6784	6. 123	7. 158
by	22	23	25	27	27	28	29
	17556	13041	9875	13149	183168	3444	4582

CASE 4.

To multiply by 111, 112, 113, *and to* 119.

RULE. Multiply as before, and add to the product the two figures which stand next on the right hand, and to the last two figures add separately what you carry.

Examples.

1. Mul.	2183	2. 4296	3. 5589	4. 6273	5. 7182	6. 83716
by	111	112	113	114	115	116
	242313	481152	631557	715122	825930	9711056

CASE 5.

To multiply by any number of nines.

RULE. Add as many cyphers to the right hand of the multiplicand as there are nines in the multiplier, and from the result subtract the multiplicand, and the remainder will be the product.

Examples.

1. Multiply 2378 by 999

	2378000
	2378
	2375622 *Ans.*

2. Multiply 37568 by 999999

	3758000000
	37568
	3757962432 *Ans.*

CASE 6.

To multiply any number of figures without the aid of intermediate lines.

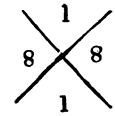
RULE. Multiply the units of the multiplicand by the units of the multiplier, set down the units of the product and carry the tens; next, multiply the tens in the multiplicand by the units of the multiplier, to which add the product of the units of the multiplicand, multipled by the tens in the multiplier, and the tens carried: then multiply the hundreds in the multiplicand by the units of the multiplier, adding the product of the tens in the multiplicand, multiplied by the tens in the multiplier, and the units in the multiplicand by the hundreds in the multiplier, and so on till you have multiplied by every figure in the multiplier.

Examples.

Multiply 35234
by 52424
1847107216

Common method.

35234
52424
140936
70468
140936
70468
176170
1847107216



Proof as heretofore directed.

CHAPTER V.

SIMPLE DIVISION.

A concise method of Long Division never before published.

Division of whole numbers is the finding how often one number is contained in another.

The number to be divided is called the dividend.

The number you divide by is called the divisor.

The number found is called the quotient.

RULE. Write down your dividend, to the left of which place your divisor, observing to separate the dividend and divisor by the sign $\frac{\cdot}{\cdot}$; draw a horizontal line at a proper distance, and then proceed to find how often the first figure of the divisor is contained in the first figure, or two first figures of the dividend; write down as often as it will go, proceed to the multiplication of the divisor by the quotient figure, subtracting mentally the result from the dividend, setting the remainder in a straight line so as to read with the next figure of the dividend, thus proceed till all be done.

METHOD OF PROOF. Multiply the quotient by the divisor adding in the remainder, if any, the product will be equal to the dividend if the work be right.

A Table of composite numbers, and their component parts.

For 14—2× 7	36—6× 6	66— 6×11	112— 7× 8 & 2
.. 16—4× 4	40—5× 8	70— 7×10	120—10×12
.. 18—3× 6	42—6× 7	72— 6×12	121—11×11
.. 20—4× 5	44—4×11	77— 7×11	132—12×11
.. 21—3× 7	45—5× 9	80— 8×10	144—12×12
.. 22—2×11	48—6× 8	81— 9× 9	150— 3× 5&10 times
.. 24—4× 6	49—7× 7	84— 7×12	160— 4× 4 ....
.. 25—5× 5	50—5×10	88— 8×11	180— 3× 6 ....
.. 27—3× 9	54—6× 9	90— 9×10	200— 2×10 ....
.. 28—4× 7	55—5×11	96— 8×12	300— 5× 6 ....
.. 30—5× 6	56—7× 8	99— 9×11	400— 5× 8 ....
.. 32—4× 8	60—5×12	100—10×10	500— 5×10 ....
.. 33—3×11	63—7× 9	108— 9×12	1000—10×10 ....
.. 35—5× 7	64—8× 8	110—11×10	

Examples.

1. Dividend. Rem.
Divisor 2)725107(1
Quotient 362553
2
Proof 725107

2. 3)7210472(

3. 4)7210416(

4. 5)7203287(

5. 6)5231037(

6. 7)2532701(

7. 8)2547325(

8. 9)25047306(

Long Division.

9. $14 \div$ 78|6|5|4|7|6|3.2|
8|2|1|2|3|0|5|
1|1|1|1|1|1|1|
10 Rem.
5|6|1|8|1 9|7.3| Quot.

10. $17 \div$ 23|7|8|6|9|5|4|7|
6|6|5|3|5|4|0|
1|1|1|1|1|
5 Rem.
1|3|9|9|2|3|2|6| Quot.

11. $18 \div$ 39|5 8|1 6|4 3|2|
3|7|6|7|4|
1|1|1|1|1|
14 Rem.
|2|1|9|8|9|8|0|1| Quot.

12. $19 \div$ 43|7|6 5|2 7|8 9|
5|5|8|4 9|2|9|
1|1|1|1|1|
4 Rem.
|2 8|2|9|7|5|1|5| Quot.

13. $21 \div$ 56|7|8|5|4|6|3|
4|1|0|
1|2|
14 Rem.
|2|7|0|4|0|6 9| Quot.

14. $26 \div$ 58|6|7|1|3 4|
6|4|7|5|3|
1|1|1|2|
|2|2|5|6|5|9| Quot.

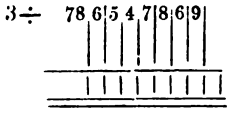
15. $28 \div$ 31|4|7|8|6|9|7|5|4|
3|6|1|6|0|5|5|7|
1|1|1|2|2|
22 Rem.
|1|1|2|4|2|3|9|1|9| Quot.

16. $32 \div$ 47|6 9|8|7|5 4|6|
5|8|1|7|9|2|
1|2|2|1|
26 Rem.
|1|4|9|0|5|8|6|0| Quot.

17. $38 \div$ 47|8|9 6|5|4|3|2|
Quot.

18. $45 \div$ 78|6|4|5|2|3|4|
Quot.

19.



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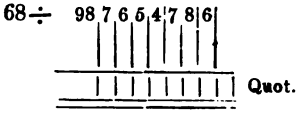

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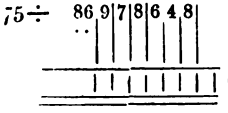

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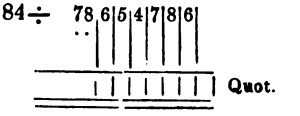

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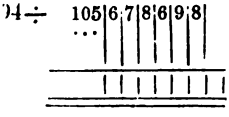

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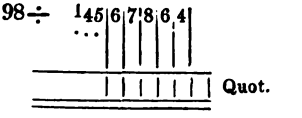

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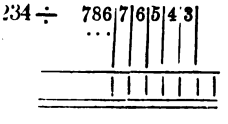

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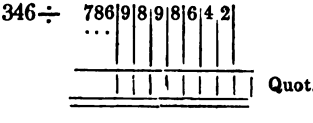

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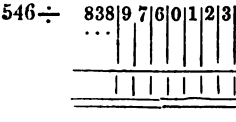

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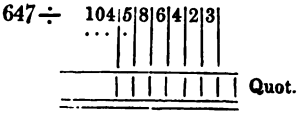

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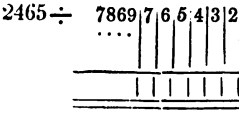

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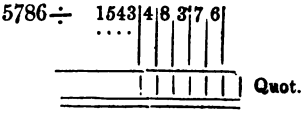

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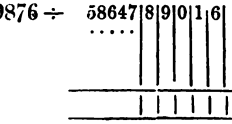

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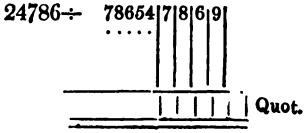


33.

10765 + 87654 | 8 | 7 | 6, | 5 | 4 | 6 |

Quot.

34.

27654 + 98765 | 7 | 8 | 6 | 4 | 5 |

Quot

NOTE. The brevity of this new method of Division will be easily discovered, as there is no question in the above exceeds ten figures, independent of the quotient.

CHAPTER VI.

REDUCTION.

REDUCTION is twofold, viz., descending and ascending. First, all great names are brought into small ones by multiplying with so many of the lesser as make one of the greater; second, all small names are brought into greater by dividing with so many of the less as make one of the greater.

To perform by Multiplication, reduce the greatest denomination to the next less, adding in the numbers of the less denomination, reduce this sum to the next lower denomination adding the numbers belonging thereto, and so proceed till all be done.

To perform by division is the converse of that by multiplication; divide the lowest denomination by so many of these as make one of the greater.

☞ In the early ages of commerce there was little or no occasion for computation, one commodity was generally bartered for another by bulk; but as civilization advanced, improvements were made, and something was daily added to the convenience of life. To remove the difficulty of bartering in kind, one commodity was generally agreed upon. To determine the substance of greatest esteem, gold and silver was universally adopted, being the most precious metals; but as the expense in the working of gold, was by much greater, than the charge for working of silver, the greater value was justly ascribed to the former; it was then found necessary to fix a proportion between these metals, and hence it is a fixed rate throughout the greater part of Europe, that one ounce of gold is worth about fifteen ounces of silver: however as improvements increased, and to give greater facility to traffic, it was soon afterwards found necessary to make coins impressed with a mark of distinction, expressing the quantity each piece contained; therefore the pound Troy was selected as the proper standard to regulate the money of this realm. Two Centuries before the conquest, Osbright, then King of England, had one ounce Troy of Silver divided into twenty pieces, called pence, so that an ounce of silver then was not worth more than 1s. 8d., which continued so until the reign of Henry VII., who valued the same at 2s. 6d., and continued so until the time of Edward the IV., who valued the ounce at 3s. 4d. After this Henry the VIII. valued the ounce of silver at 3s. 9d., which continued till Queen Elizabeth's time, she increased the value of the ounce Troy to 5s., as it remains to this day.

Money Table.

Farthings.			Pence.			Shillings.		
qr.	*s.*	*d.*	*d.*	*s.*	*d.*	*s.*	£.	*s.*
4 are		1	12 are	1	0	20 are	1	0
8 ..		2	20 ..	1	8	30 ..	1	10
12 ..		3	24 ..	2	0	40 ..	2	0
16 ..		4	30 ..	2	6	50 ..	2	10
20 ..		5	36 ..	3	0	60 ..	3	0
24 ..		6	40 ..	3	4	70 ..	3	10
28 ..		7	48 ..	4	0	80 ..	4	0
32 ..		8	50 ..	4	2	90 ..	4	10
36 ..		9	60 ..	5	0	100 ..	5	0
40 ..		10	70 ..	5	10	110 ..	5	10
44 ..		11	72 ..	6	0	120 ..	6	0
48 ..	1	0	80 ..	6	8	130 ..	6	10
52 ..	1	1	84 ..	7	0	140 ..	7	0
56 ..	1	2	90 ..	7	6	150 ..	7	10
60 ..	1	3	96 ..	8	0	160 ..	8	0
64 ..	1	4	100 ..	8	4	170 ..	8	10
68 ..	1	5	108 ..	9	0	180 ..	9	0
72 ..	1	6	110 ..	9	2	190 ..	9	10
76 ..	1	7	120 ..	10	0	200 ..	10	0
80 ..	1	8	130 ..	10	10	210 ..	10	10
84 ..	1	9	132 ..	11	0	220 ..	11	0
88 ..	1	10	140 ..	11	8	230 ..	11	10
92 ..	1	11	144 ..	12	0	240 ..	12	0
96 ..	2	0	150 ..	12	6	250 ..	12	10
100 ..	2	1	156 ..	13	0	260 ..	13	0
104 ..	2	2	160 ..	13	4	270 ..	13	10
108 ..	2	3	168 ..	14	0	280 ..	14	0
112 ..	2	4	170 ..	14	2	290 ..	14	10

General Rule.

All great names are made less by multiplication.
All less names are made greater by division.

Examples of Coin.

1. In 345600 farthings, how many pence, shillings, and pounds?

4 ÷ 345600 farthings
12 ÷ 86400 pence
20 ÷ 720,0 shillings
360*l.* *Ans.*

Short method.

960 ÷ 3456|0|0|far.
6|.|
7|.|
5|.|
360*l.* *Ans.*

2. In 360*l.* how many farthings?

360*l.*
20
7200 shillings
12
86400 pence
4
Ans. 345600 farth.

3. In 7*l* how many pence?
240 pence in a pound.

7
Ans. 1680 pence

4. In 1680 pence how many pounds?

240)1680(.*d.*
.
.
7*l.* *Ans.*

5. In 7*l.* 14s. 9¼d. how many shillings, pence, and farthings?

7*l.* 14s. 9¼d.
20
154 shillings
12
1857 pence
4
Ans. 7429 farthings

6. In 7429 farthings, how many pence, shillings, and pounds?

960) 7429 48) 709 4) 37
.... . 2
2

Ans. 7*l.* 14 9¼

7. How many shillings and pence in 23*l.*

23*l.*
20
460 shillings
12
Ans. 5520 pence

8. In 5520 pence, how many shillings and pounds?

12) 5520
2.0 46,0 shillings
23*l.* *Ans.*

Otherwise.

240) 552|0|.
|2|.
|7|.
23*l.* *Ans.*

9. Reduce 351*l.* 13s. 0¾d. to farthings?

351*l.* 13s. 0¾d
20
7033
12
84396
4
Ans. 337587 farthings

10. In 337587 farthings, how many pounds.

Farth. (48)
960) 3375|8 7| 627 0¾
5 8| 4
9 5| 1
4 1|
351*l.* 13 0¾ *Ans.*

11. In 51*l.* 16s. 9¾d. how many shillings, pence, and farthings?

51*l.* 16s. 9¾d.
20
1036 shillings
12
12441 pence
4
Ans. 49767 farthings

12. In 49767 farthings, how many pence, shillings, and pounds?

Farth. 48÷ 4÷
960÷ 4976 | 7 | 807 | 39
6 | 2
7 | 3
1

Ans. 51*l* 16 9¾

13. In 146*l.* 15s. 6¾d., how may farthings?

Ans. 140907 farthings.

14. Reduce 986*l.* 15s. 6½d. to farthings.

Ans. 947306 farthings.

15. In 140907 farthings, how many pounds?

Ans. 146*l.* 15s. 6¾d.

16. Bring 947306 farthings to pounds. *Ans.* 986*l.* 15s. 6½d.

17. In 100*l.* 19s. 11¾d., how many farthings?

Ans. 96959 farthings.

18. In 1000*l.*, how many farthings? *Ans.* 960000 farthings.

19. In 96959 farthings, how many pounds?

Ans. 100*l.* 19s. 11¾d.

20. In 960000 farthings, how many pounds? *Ans.* 1000*l.*

The above examples will suffice; but the judicious Teacher may extend the principle as far, as to the advantage of his pupils, he may deem right.

NOTE. The readiest way to reduce pounds, shillings, and pence, to pence, is to multiply the pounds by 240, to which add the pence of the shillings and pence; and to bring farthings to pounds, divide the farthings by 960, and the result will be pounds.

WEIGHTS AND MEASURES.

Troy Weight.

TROY WEIGHT has its name from Troyes, a town in France, in the province of Champagne, and department of the Aube, and was introduced by William the Conqueror; by it are weighed Gold, Silver, Jewels, and Liquors. Its denominations are as follow:—

24 Grains.... make.... 1 dwt. | 20 Dwts..... make .... 1 oz.
12 Oz..... make..... 1 lb.

Practice Table of Troy Weight.

oz.	dwts.	grs.	lb.	oz.	dwts.	grs.
12	0	0	1	12	240	5760
0	20	0	$\frac{1}{12}$	1	20	480
0	1	24	$\frac{1}{240}$	$\frac{1}{20}$	1	24
0	0	1	$\frac{1}{5760}$	$\frac{1}{480}$	$\frac{1}{24}$	1
6	0	0	$\frac{1}{2}$			
4	0	0	$\frac{1}{3}$			
3	0	0	$\frac{1}{4}$			
2	8	0	$\frac{1}{5}$			
2	0	0	$\frac{1}{6}$			
1	10	0	$\frac{1}{8}$			
1	0	0	$\frac{1}{12}$			
0	10	0	$\frac{1}{24}$	$\frac{1}{2}$		
0	6	16	$\frac{1}{36}$	$\frac{1}{3}$		
0	5	0	$\frac{1}{48}$	$\frac{1}{4}$		
0	4	0	$\frac{1}{60}$	$\frac{1}{5}$		
0	3	8	$\frac{1}{72}$	$\frac{1}{6}$		
0	2	12	$\frac{1}{96}$	$\frac{1}{8}$		
0	2	0	$\frac{1}{120}$	$\frac{1}{10}$		
0	1	16	$\frac{1}{144}$	$\frac{1}{12}$		
0	1	0	$\frac{1}{240}$	$\frac{1}{20}$	1	
0	0	12	$\frac{1}{480}$	$\frac{1}{40}$	$\frac{1}{2}$	
0	0	6	$\frac{1}{960}$	$\frac{1}{80}$	$\frac{1}{4}$	
0	0	4	$\frac{1}{1440}$	$\frac{1}{120}$	$\frac{1}{6}$	
0	0	3	$\frac{1}{1920}$	$\frac{1}{160}$	$\frac{1}{8}$	
0	0	2	$\frac{1}{2880}$	$\frac{1}{240}$	$\frac{1}{12}$	
0	0	1	$\frac{1}{5760}$	$\frac{1}{480}$	$\frac{1}{24}$	

RULE. Pounds × by 12, are ounces; ounces × by 20, are pennyweights; pennyweights × by 24, are grains. Grains ÷ by 24, are pennyweights; pennyweights ÷ by 20, are ounces; ounces ÷ by 12, are pounds.

Examples.

21. In 24 lb. Troy, how many ounces, pennyweights, and grains?
Ans. 288 oz. 5760 dwts. 138240 grs.

22. How many pounds Troy in 138240 grains? *Ans.* 24 lb.

23. How many pounds Troy are in 85960 grains?
Ans. 14 lb. 11 oz. 1 dwt. 16 grs.

24. In 14 lb. 11 oz. 1 dwt. 16 grs., how many grains?
Ans. 85960 grains.

25. In 75 lb. 11 oz. 19 dwts. 23 grs., how many grains?
Ans. 437759 grs.

26. In 437759 grains, how many pounds Troy?
Ans. 75 lb. 11 oz. 19 dwts. 23 grs.

27. In 16 lb. 0 oz. 14 dwts. 21 grs., how many grains?
Ans. 92517 grs.

28. In 92517 grains, how many pounds Troy?
Ans. 16 lb. 0 oz. 14 dwts. 21 grs.

29. Sold 8 Silver Teapots, each weighing 3 lb. 9 oz. 18 dwts. 13 grs. how many grains were in all? *Ans.* 176360 grs.

30. In 176360 grains how many pounds?
Ans. 3 lb. 9 oz. 18 dwts. 13 grs.

31. What quantity of Gold will it require to make twelve gold ornaments, each weighing 1 oz. 18 dwts. 12 grs.
Ans. 23 oz. 2 dwts. 0 grs.

32. How many Silver Tablespoons each weighing 4 oz. 14 dwts. can be made out of 2 lb. 4 oz. 4 dwts. of Silver. *Ans.* 6 spoons.

*Avoirdupois Weight**

Signifies a medium of weight; by it are weighed all goods that are subject to waste, as Groceries of all kinds, Tallow, Pitch, Hemp, Flax, Wool, and all kinds of metals, except Gold and Silver.

Common Weight

16 drs.	1 oz.
16 oz.	1 lb.
14 lb.	1 stone.
2 stone or 28 lb	1 qr.
4 qrs.	1 cwt.
20 cwt.	1 ton.

Wool Weight in England, 15 lb. make a stone, in Ireland, 16 lb. to the stone.

England.

15 lb.	1 stone.
2 stones or 30 lb.	1 tod.
8 tods or 240 lb.	1 pack or sack.

*The corresponding proportion between Avoirdupois and Troy weight.

1 lb. Avoirdupois weight = 14 oz. 11 dwts. 15½ grs. Troy.
1 oz. ——— = 0 oz. 18 dwts. 5½ grs.
1 dr. ——— = 0 oz. 1 dwt. 3½ grs.

A pound Avoirdupois contains 7000 grains nearly, and a pound Troy 5760 grains, consequently they are to each other as 17 to 14 nearly; or, multiply the pounds Troy by 144, and divide by 175, and you will have the pounds Avoirdupois.

Denomination and Practice Table of Avoirdupois Weight.

CWT.	QRS.	lb.	TON.	CWT.	QRS.	STONE.	lb.	OZ.	DRS.
20	0	0 are	1	20	80	160	2240	35840	573440
10	0	0 ..	$\frac{1}{2}$						
5	0	0 ..	$\frac{1}{4}$						
4	0	0 ..	$\frac{1}{5}$						
2	3	12 ..	$\frac{1}{7}$						
2	2	0 ..	$\frac{1}{8}$						
2	0	0 ..	$\frac{1}{10}$						
1	1	0 ..	$\frac{1}{16}$						
0	2	0 ..	$\frac{1}{40}$	$\frac{1}{2}$					
0	1	0 is	$\frac{1}{80}$	$\frac{1}{4}$	1				
1st	0lb	..	$\frac{1}{160}$	$\frac{1}{8}$	$\frac{1}{2}$	1			
0	8	are	$\frac{1}{280}$	$\frac{1}{14}$	$\frac{2}{7}$	$\frac{4}{7}$	8		
0	7	..	$\frac{1}{320}$	$\frac{1}{16}$	$\frac{1}{4}$	$\frac{1}{2}$	7		
0	4	..	$\frac{1}{560}$	$\frac{1}{28}$	$\frac{1}{7}$	$\frac{2}{7}$	4		
0	$3\frac{1}{2}$	..	$\frac{1}{640}$	$\frac{1}{32}$	$\frac{1}{8}$	$\frac{1}{4}$	$3\frac{1}{2}$		
0	1	is	$\frac{1}{2240}$	$\frac{1}{112}$	$\frac{1}{28}$	$\frac{1}{14}$	1		
	1oz.	..	$\frac{1}{35840}$	$\frac{1}{1792}$	$\frac{1}{448}$	$\frac{1}{264}$	$\frac{1}{16}$	1	
	1dr.	..	$\frac{1}{573440}$	$\frac{1}{28672}$	$\frac{1}{7168}$	$\frac{1}{3584}$	$\frac{1}{256}$	$\frac{1}{16}$	1

Customary Weight of Goods.

	lb.
A Firkin of Butter is - -	56
A Firkin of Soap - - -	64
A Barrel of Soap - - -	256
A Barrel of Pot Ashes -	200
A Barrel of Anchovies -	30
A Barrel of Figs from 96 lb. to $2\frac{1}{4}$ cwt.	
A Barrel of Candles - -	120
A Barrel of Butter - -	224
A Puncheon of Prunes, 10 or 12 cwt.	
A Fother of Lead, 19 cwt. 2 qrs. or - - - - - -	2184
A Stone of Iron or Shot -	14
A Gallon of Train Oil -	$7\frac{1}{2}$
A Fagot of Steel - - -	120

Customary Weight of Goods continued.

	lb.
A Stone of Glass - - -	5
A Quintal of Fish in New-Foundland - - - -	100
A Seam of Glass, 24 st. or	120
A Stone of Cheese - - -	16
A Stone of Meat in London	8
A Stone of Meat in the Country - - - - -	14
A Stone of Hemp - - -	32
A Stone, Horseman's Weight	14
A Chest of Tea - - -	84
A Load of Meal, or Potatoes	240

	lb.	*oz.*	*dr.*
A Peck Loaf weighs	17	6	1
A Half-peck - -	8	11	0
A Quartern- - - -	4	5	8
A Peck (or Stone) of Flour - - - - -	14	0	0
A Bushel of Flour -	56	0	0
A Barrel of American Flour - - - - -	196	0	0
A Pack, or Load of Flour - - - - -	240	0	0
A Sack, or 5 Bushels of Flour* - - -	280	0	0

The common sizes of Books, are,

			MARKED
Folio,	of which	2 leaves make a sheet	ffo.
Quarto,	.....	4	4to.
Octavo,	.....	8	8vo.
Duodecimo,	.....	12	12mo.
Octodecimo,	.....	18	18mo.

Law

90 words in Chancery.. 1 folio | 80 words in Exchequer.. 1 folio
72 words in Common Law....1 folio.

Tons.	×	by 20 are cwts.	Drs.	÷	by 16 are oz.
Cwts.	×	by 4 are qrs.	Oz.	÷	by 16 are lb.
Qrs.	×	by 28 are lb.	Lb.	÷	by 28 are qrs.
Lb.	×	by 16 are oz.	Qrs.	÷	by 4 are cwts.
Oz.	×	by 16 are drs.	Cwts.	÷	by 20 are tons.

A compendious method of reducing Hundreds, Quarters, and Pounds, to Pounds.

RULE.—Multiply the cwts. by 12. and to the product mentally add the lb. of the odd weight, which sum is to be so placed under the cwts., that the place of cwts. in this may fall under the units of that, the whole added will give the answer.

*In some parts of England, a sack of flour is 18 stones, or 252 pounds.

Examples.

33. In 123 cwt. 3 qrs. 10 lb. how many lb.?

cwt.	qrs.	lb.	lb.		cwt.	qrs.	lb.		The common method. cwt.	qrs.	lb.
123	3	10	=94	or thus	123	3	10		123	3	10
	1570					123				4	
Ans.	13870	lb.				123				495	
						12394				28	
				Ans.	13870	lb.				3960	
										991	
									13870	*Ans.*	

NOTE. The new method 4 figures, exclusive of the answer, the common method, 14.

34. In 13870 lb., how many cwts?

		lb.					
112÷	138	7	0	28÷94	10		
		6	3				
		2	4				
	cwt.	123			3	10	*Ans.*

35. In 264 cwt. 3 qrs. 12 lb. 11 oz., how many oz. *Ans.* 474635 oz.
36. In 474635 oz., how many cwts?
Ans. 264 cwt. 3 qrs. 12 lb. 11 oz.
37. In 139 cwt. 1 qr. 22 lb. 13 oz. how many oz. *Ans.* 249901 oz.
38. In 249901 oz., how many cwts?
Ans. 139 cwt. 1qr. 22 lb. 13 oz.
39. In 135 cwt. short cwt, each 112 lb., how many long cwt, each 120 lb? *Ans.* 126 cwts.
40. In 976 cwt. 3 qrs. 27 lb., how many lb.? *Ans.* 109423 lb.
41. Bought 24 bags of flour, each weighing 2 cwt. 2 qrs. 13 lb., how many lb. in all? *Ans.* 7032 lb.
42. In 3 cwt. 2 qrs. 14 lb. of Sugar, how many parcels are there, each containing half a pound? *Ans.* 812 parcels.
43. How many pounds are there in 1427 oz? *Ans.* 89 lb. 3 oz.
44. How many oz. in 20 tons 17 cwt. 3 qrs. 27 lb?
Ans. 749040 oz.

Apothecaries' or Chemists' Weight.

Is the same as Troy Weight in value; an Apothecaries' lb is.= to a pound (Troy,) and contains the same number of ozs. and grs.;

but instead of dwts, the oz. is divided into *scruples* and *drams*: by it Chemists and Apothecaries compound their materials, but buy and sell by Avoirdupois. Its denominations are as follow.—

20 grains..... 1 scruple	8 drams..... 1 ounce
3 scruples..... 1 dram	12 ounces ..... 1 pound
Lb. × by 12 are ounces	Drs. × by 3 are scruples
Oz. × by 8 are drams	Scrs. × by 20 are grains
Grs. ÷ by 20 are scruples	Drs. ÷ by 8 are ounces
Scrs. ÷ by 3 are drams	Oz. ÷ by 12 are pounds

Apothecaries' or Chemists' Weight, used in compounding Medicines.

20 grains (Troy)	make	1 scruple, ℈.
3 scruples	....	1 dram, ʒ.
8 drams	....	1 ounce ℥.
12 ounces	....	1 pound ℔.

NOTE. The same grain, ounce, and pound, as Troy weight.

Apothecaries' Fluid Measure.

60 Minims* (♏)	make	1 Fluidrachm, *F.* ʒ.
8 Fluidrachms	....	1 Fluid ounce *F.* ℥.
16 Fluid ounces	....	1 Pint 0.
8 Pints	....	1 Gallon *cong.*

Abbreviations employed by the faculty in prescriptions, &c.

℞. (for recipe) take	q. s. (quantum sufficit) a sufficient quantity.
ss. (for semis) the half.	
cochl. (cochleare) a spoonful.	cong. (congius) a gallon.

M. (manipulus) a handful, or M. (for misce) mix.

P. (pugillum) as much as can be taken between the two forefingers and the thumb.

The numbers in prescriptions are expressed by small Roman numerals: thus,

gt. j. (for gutta I) 1 drop.	ʒ vij. 7 drachms.
♏ ij. 2 minims, or drops.	ʒ iijss. 3½ drachms.
♏ iv. 4 minims.	f ʒ ij. 2 fluidrachms.
♏ xij. 12 minims.	℥ j. 1 ounce
gr. xxvj . 26 grains.	℥ ss. half ounce.
℈ j. 1 scruple.	℔ ijss. 2½ pounds.
℈ ss. half a scruple.	0 iij. 3 pints.

*The Edinburgh and Dublin Colleges still retain the term *gutta* (drop) instead of *minim*.

45. In 17 lb., how many ounces, drams, and scruples?
Ans. 204 oz. 1632 drs. 4896 scr.

46. How many pounds in 4896 scruples? *Ans.* 17 lb.

47. A patient is allowed to take daily 2 drs. 2 scrs. of bark, how long will 7 lb. last him? *Ans.* 252 days.

48. How many grains are in 231 lb. 3 oz. 5 grs.?
Ans. 1332005 grs.

49. In 1332005 grs., how many pounds?
Ans. 231 lb. 3 oz. 5 grs.

50. In 7 oz. 5 drs. 3 scrs., how many scruples? *Ans.* 186 scrs.

Lineal, or Long Measure.

3	Barley-Corns, b. c. are	1	Inch, in.
4	Inches, or 12 b. c.	1	Hand, h.
12	Inches, or 3 h.	1	Foot, ft.
3	Feet, or 36 in.	1	Yard, yd.
5	Feet, or 60 in.	1	Pace, p.
2	Yards, or 6 ft.	1	Fathom, f.
5½	Yards, or 16½ ft.	1	Rod, Pole or Perch, r. or p.
4	Poles, or 22 yds.	1	Land Chain, l. ch.
40	Rods, or 10 ch. or 220 yds.	1	Furlong, fur.
8	Fur., or 80 ch. or 1760 yds.	1	Mile, m.
3	Miles, or 5280 yds.	1	League, l.
69½	Miles, English statute	1	Degree, d.

360 Degrees the circumference of the Globe.
A nautical mile, 6075.81 feet.
The earth's circumference is equal to 131237500 feet, or 24855½ miles, very nearly.

An inch is divided into 8 parts by joiners, engineers, and mechanics; into 10 parts by surveyors, architects, and others; and 12 parts when used duodecimally. The chain used for measuring land is 66 feet, and it is divided into 100 links, each of them 7.92 inches.

Comparison of Foreign Measures of Length with English.

	yards.		yards.
Mile of England	1760	Small league in Germany	5866
— Scotland	1984	— Spain	5028
— Ireland	2200	— Poland	4400
Small league in France	2933	— Hungary	8800
— Mean ditto	3666	— Ancient Greece	1624
— Large ditto	4400	— Sweden & Denmark	7233
— Italy	1467	— Russia (verst)	1167

RULE. Miles × by 8 are furlongs. Furlongs × by 40 are poles Poles × by 16½ are feet English; Poles × by 21 are feet Irish. Feet × by 12 are inches. Inches × by 3 are barley-corns.

Examples.

51. In 273 miles, how many inches? *Ans.* 17297280 inches.
52. In 17297280 inches, how many miles? *Ans.* 273 English.
53. In 273 Irish miles, how many inches? *Ans.* 22014720 in.
54. How many miles are there in 22014720 inches?
Ans. 273 Irish.
55. In 45 miles, 3 furlongs, 4 yards, 3 feet, how many feet?
Ans. 304935 feet Irish.
56. How many miles are there in 304935 feet Irish?
Ans. 45 m. 8 f. 4 yds. 3 f.

Cloth Measure.

Hollands are measured by the Ell (English), and Tapestry by the Ell (Flemish). The weaving of Muslin is paid for by the Ell (English) but bought and sold by the yard. Linens, Woollens, wrought Silks, and Tape, are sold by the yard.

$2\frac{1}{4}$	inches	1 Nail	Yds. × by 4 are Quarters
4	nails	1 Quarter	Qrs. × by 4 are Nails
4	quarters	1 Yard	Nails × by $2\frac{1}{4}$ are Inches
3	quarters	1 Ell (Flemish)	Nails ÷ by 4 are Quarters
5	quarters	1 Ell (English)	Qrs. ÷ by 4 are Yards
6	quarters	1 French Ell	

Ells (French) × by 3, and ÷ by 2 are Yards
Yards — × by 2, and ÷ by 3 are Ells—French
Yards — × by 4, and ÷ by 3 are Ells—Flemish
Yards — × by 4, and ÷ by 5 are Ells—English
Ells (French) × by 6, and ÷ by 5 are Ells—English
Ells (English) × by 5, and ÷ by 4 are Yards
Ells (Flemish) × by 3, and ÷ by 4 are Yards
Ells (French) × by 2 are Ells—Flemish
Ells (English) × by 5, and ÷ by 6 are Ells—French
Ells (English) × by 5, and ÷ by 3 are Ells—Flemish
Ells (Flemish) × by 3, and ÷ by 5 are Ells—English
Ells (Flemish) ÷ by 2 are French Ells

Rule. Yards × by 4 are quarters. Quarters × by 4 are nails. Yards × by 3 are quarters Flemish. Yards × by 5 are quarters English. Yards × by 6 are quarters French.

Examples.

57. How many nails in 40 yards? *Ans.* 640 nails.
58. In 640 nails, how many yards? *Ans.* 40 yards.
59. In 20 yds. 3 qrs. 1 nail, how many nails? *Ans.* 333 nails.
60. How many yards are in 333 nails? *Ans.* 20 yds. 3 qrs. 1 na.
61. How many quarters in 30 yds. 3 qrs.? *Ans.* 123 qrs.

62. In 123 qrs, how many yards? *Ans.* 30 yds. 3 qrs.
63. How many quarters in 40 ells English? *Ans.* 200 qrs.
64. In 200 qrs., how many ells English?
Ans. 40 ells, English.

Imperial Liquid Measure,

Established by Act of Parliament as a General Measure of Capacity for Liquid and Dry Articles.

The Imperial Gallon is the legal standard for regulating all other measures. It must contain 10 lbs. Avoirdupois Weight of pure water, and at the temperature of 62 deg. of Fahrenheit's thermometer. This quantity measures 277$\frac{1}{4}$ cubic inches, very nearly; being about one-fifth greater than the Old Wine Measure, one thirty-second greater than the Old Dry Measure, and one-sixtieth less than the Old Ale Measure.

In Wine and Spirit Measure,

2 Pints* make - - - - - -	1 Quart
4 Quarts - - - - - - -	1 Gallon†
63 Gallons - - - - - -	1 Hogshead‡
84 Gallons - - - - - -	1 Puncheon
2 Hhds. or 126 Gals - - -	1 Pipe or Butt
4 Hhds. or 252 Gals - - -	1 Tun

In Ale, Beer, and Porter Measure,

2 Pints make - - - - - -	1 Quart
4 Quarts - - - - - - -	1 Gallon
9 Gallons - - - - - -	1 Firkin
2 Firkins, or 18 Gallons - -	1 Kilderkin
2 Kilderkins, or 36 Gallons -	1 Barrel
3 Kilderkins, or 54 Gallons -	1 Hogshead
2 Hogsheads, or 108 Gallons	1 Butt

*A quarter of a pint is called a gill, or noggin; but in some parts half a pint is termed a gill, and a quarter pint is termed a jack.

†The Old Ale Gallon contained 282 cubic inches.

‡The quantity of a Hogshead or Pipe is various in different sorts of wine: thus of

Claret	63 gallons are	1 hogshead
Maderia	110 gallons -	1 pipe
Vidonia	120 gallons -	1 pipe
Sherry	130 gallons -	1 pipe
Port	138 gallons -	1 pipe
Lisbon, Bucellas	140 gallons -	1 pipe

But these measures are not uniformly adhered to; and the casks are usually charged by the number of gallons they contain.

Practice Table of Liquid Measure.

	TUN.	PIPE.	PUN.	HHD.	TIER.	GAL.	POTTL	QTS.	PTS.
1 tun	1	2	3	4	6	252	504	1008	2016
1 pipe	$\frac{1}{2}$	1							
1 pun.	$\frac{1}{3}$	$\frac{2}{3}$	1						
1 hhd	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1					
1 tier.	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{2}{3}$	1				
36 gal.	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{4}{7}$	$\frac{6}{7}$				
28 ..	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{1}{3}$	$\frac{4}{9}$	$\frac{2}{3}$				
21 ..	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$				
18 ..	$\frac{1}{14}$	$\frac{1}{7}$	$\frac{3}{14}$	$\frac{2}{7}$	$\frac{3}{7}$				
14 ..	$\frac{1}{18}$	$\frac{1}{9}$	$\frac{1}{6}$	$\frac{2}{9}$	$\frac{1}{3}$				
12 ..	$\frac{1}{21}$	$\frac{1}{24}$	$\frac{1}{7}$	$\frac{4}{21}$	$\frac{2}{7}$				
9 ..	$\frac{1}{28}$	$\frac{1}{14}$	$\frac{3}{28}$	$\frac{1}{7}$	$\frac{3}{14}$				
7 ..	$\frac{1}{36}$	$\frac{1}{18}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{1}{6}$				
6 ..	$\frac{1}{42}$	$\frac{1}{21}$	$\frac{1}{14}$	$\frac{2}{21}$	$\frac{1}{7}$				
4 ..	$\frac{1}{63}$	$\frac{2}{63}$	$\frac{1}{21}$	$\frac{4}{63}$	$\frac{2}{21}$				
3 ..	$\frac{1}{84}$	$\frac{1}{42}$	$\frac{1}{28}$	$\frac{1}{21}$	$\frac{1}{14}$				
2 ..	$\frac{1}{126}$	$\frac{1}{63}$	$\frac{1}{42}$	$\frac{2}{63}$	$\frac{1}{21}$				
1 ..	$\frac{1}{252}$	$\frac{1}{126}$	$\frac{1}{84}$	$\frac{1}{63}$	$\frac{1}{42}$				
1 potl	$\frac{1}{504}$	$\frac{1}{252}$	$\frac{1}{168}$	$\frac{1}{126}$	$\frac{1}{84}$	$\frac{1}{2}$			
1 qrt.	$\frac{1}{1008}$	$\frac{1}{504}$	$\frac{1}{336}$	$\frac{1}{252}$	$\frac{1}{168}$	$\frac{1}{4}$	$\frac{1}{2}$		
1 pint	$\frac{1}{2016}$	$\frac{1}{1008}$	$\frac{1}{672}$	$\frac{1}{504}$	$\frac{1}{336}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	
$\frac{1}{2}$ pint	$\frac{1}{4032}$	$\frac{1}{2016}$	$\frac{1}{1344}$	$\frac{1}{1008}$	$\frac{1}{672}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$
1 nog.	$\frac{1}{8064}$	$\frac{1}{4032}$	$\frac{1}{2688}$	$\frac{1}{2016}$	$\frac{1}{1344}$	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$

RULE. Tuns × by 4 are hhds. Hogsheads × by 63 are gals. Gallons × multiplied by 4 are qts. Quarts × by 2 are pts. Pints ÷ by 2 are qts. Quarts ÷ by 4 are gals. Gallons ÷ by 63 are hhds. Hogsheads ÷ by 4 are tuns.

Examples.

65. In 20 tuns 3 hhds. 50 gals., how many gallons?

Ans. 5279 gals.

66. In 5279 gals., how many tuns?

Ans. 20 tuns 3 hhds. 50 gals.

67. How many pints are there in 3 hhds. 20 gals. 1 qt.?

Ans. 1674 pts.

68. In 1674 pts., how many hogsheads?

Ans. 3 hhds. 20 gals. 1 qt.

69. In 21 gals. 2 qts. 1 pt., how many pints. *Ans.* 173 pts.
70. In 173 pts., how many gallons? *Ans.* 21 gals. 2 qts. 1 pt.

Dry Measure.

2 Pints make 1 Quart	4 Pecks make 1 Bushel*
4 Quarts - - 1 Gallon	8 Bushels - 1 Quarter
2 Gallons - - 1 Peck	

The Old Dry Gallon contained 268 four-fifths cubic inches.

OBSOLETE. A coom=4 bushels; a chaldron=4 quarters; a wey =5 quarters; a last=2 weys.

Coals are now sold by weight only.

Examples.

71. In 24 gals. 2 qts. 1 pt., how many pints? *Ans.* 197 pts.
72. In 4687 pts., how many gallons? *Ans.* 585 gals. 3 qts. 1 pt.
73. How many pints are there in 3 hhgs. 20 gals. 1 qrt.? *Ans.* 1674 pts.
74. In 30720 quarts of corn, how many quarters? *Ans.* 120 qrs.
75. In a hogshead of wine containing 63 gals., how many gills are there? *Ans.* 2016 gills.
76. How many tuns are there in 10080 pts.? *Ans.* 5 tuns.

Time.

60 Seconds, (sec.) are - - - - -	1 Minute, min.
60 Minutes - - - - - - - - -	1 Hour, hr.
24 Hours - - - - - - - - -	1 Day, d.
7 Days - - - - - - - - -	1 Week, wk.
4 Weeks, or 28 Days - - - -	1 Lunar Month, m.
28, 29, 30, or 31 Days - - - -	1 Calendar Month
52 Weeks, 1 day, 6 hours, or 365 days, 6 hours - - - - -	1 Julian Year, yr.
365 Days, 5 h. 48 min. 57 sec. - -	1 Solar Year
100 Years - - - - - - - - -	1 Century
12 Calendar or 13 Lunar Months -	1 Year

To know the days in each month observe,

The days are thirty in September,
April, June, and November,
Twenty-eight in February alone,
In each other thirty-one;

* A Strike is properly 2 Bushels; but in some districts these terms are reversed, or used the one for the other.

But in every Leap-year,* you'l find,
February counts twenty-nine.

Geometry.

60 Seconds''	make - - - - - -	1 Minute'
60 Minutes	- - - - - - - - -	1 Degree °
90 Degrees	- - - - - - - - -	1 Quadrant
360 Degrees, or 4 Quadrants	- - -	1 Circle

Many highly important calculations in the Mathematical Sciences are founded on this division of the circle.

In Geography, a Degree of Latitude (or of Longitude on the Equator), measures 69·07, or nearly $69\frac{1}{10}$ British miles.

A geographical, or nautical mile, is one-sixtieth part, or a minute, of a Degree: six geographical miles are nearly equal to seven English miles.

In Astronomy, the great circle of the Ecliptic (or the Zodiac) is divided into 12 signs, each 30 degrees.

The Six Northern Signs:

Spring Signs.

The Sun enters,
- ♈ *Aries*, the Ram, March 21.
- ♉ *Taurus*, the Bull, April 20.
- ♊ *Gemini*, the Twins, May 21.

Summer Signs.

The Sun enters,
- ♋ *Cancer*, the Crab, June 21.
- ♌ *Leo*, the Lion, July 23.
- ♍ *Virgo*, the Virgin, August 23.

The Six Southern Signs.

Autumnal Signs.

The Sun enters,
- ♎ *Libra*, the Balance, September 23.
- ♏ *Scorpio*, the Scorpion, October 23.
- ♐ *Sagittarius*, the Archer, November 21.

Winter Signs.

The Sun enters,
- ♑ *Capricornus*, the Goat, December 21.

* The leap year is found by dividing by 4: if even, it is leap year; if odd, so many after leap year.

♒ *Aquarius*, the Water-Bearer, January 20.
♓ *Pisces*, the Fishes, February 18.*

The apparent progress of the Sun through these Signs causes the variation in the length of days, and the consequent vicissitudes of the Seasons. Our Spring commences at the Vernal Equinox, (March 21), when the Sun enters Aries; Summer, at the Summer Solstice, (June 21), when he enters Cancer; Autumn, at the Autumnal Equinox, (September 23), when he enters Libra; and Winter, at the Winter Solstice, (December 21), when he enters Capricorn.

The Longest Day is that of the Summer Solstice, and the Shortest, that of the Winter Solstice. At the equinoxes, the day and night are every where equal.

☉ *Sol*, The Sun, the centre of the Solar System.
☽ *Luna*, The Moon, a secondary planet, attending the Earth.

Wandering Stars, called Planets.

Mercury,	Venus,	The Earth,	Mars,
☿	♀	⊕	♂
Jupiter,	Saturn,	Herschel,	
♃	♄	♅	

Examples.

77. In 72015 hrs., how many weeks? *Ans.* 428 wks. 4 ds. 15 hrs.
78. How many hours are there in 428 wks. 4 ds. 15 hss.?
Ans. 72015 hrs.
79. In 1440, minutes, how many seconds? *Ans.* 86400 secs.
80. How many minutes are there in 86400 seconds?
Ans. 1440 mins.
81. If a clock strikes 156 times a day, how often will it strike in 6 years? *Ans.* 341640 times.
82. How many minutes has a boy lived who is 10 years and 6 weeks old? *Ans.* 5302080 mins.
83. How many inches would reach round the globe of the earth, its circumference being 360 degrees, and each degree 60 miles?
Ans. 1368576000 inches.
84. If the circumference of the globe of the earth in inches, be equal to 1368576000, I want to know its circumference in miles?
Ans. 21600 miles.

* It will be easy to recollect the order of these, by the aid of Dr. Watts's memorial lines:—

"The Ram, the Bull, the heavenly Twins,
And next the Crab, the Lion shines,
The Virgin, and the Scales:
The Scorpion, Archer, and Sea-goat,
The man that holds the Water-pot,
And Fish, with glittering tails."

85. How many years and days is it, since the victory at Waterloo, which was gained on the 18th June, 1815, it being now the 1st January, 1847? *Ans.* 32 yrs. 196 ds.

CHAPTER VII.

ADDITION OF MONEY.

Practice Table of Money.

10s	0d			of 10s 0d	of 6s 8d	of 5s 0d	of 3s 4d	of 2s 6d	of 2s 0d	of 1s 8d	of 1s 0d	of 10d
6	8	$\frac{1}{3}$	...									
5	0	$\frac{1}{4}$	...	$\frac{1}{2}$								
3	4	$\frac{1}{6}$	...	$\frac{1}{3}$	$\frac{1}{2}$							
2	6	$\frac{1}{8}$	...	$\frac{1}{4}$	...	$\frac{1}{2}$						
2	0	$\frac{1}{10}$	...	$\frac{1}{5}$	...	...						
1	8	$\frac{1}{12}$	...	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$					
1	4	$\frac{1}{15}$	...	...	$\frac{1}{5}$	...	...					
1	3	$\frac{1}{16}$	...	$\frac{1}{8}$	...	$\frac{1}{4}$	...	$\frac{1}{2}$				
1	0	$\frac{1}{20}$	...	$\frac{1}{10}$	...	$\frac{1}{5}$	...	...	$\frac{1}{2}$			
0	10	$\frac{1}{24}$	...	$\frac{1}{12}$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	...	$\frac{1}{2}$		
0	8	$\frac{1}{30}$	...	$\frac{1}{15}$	$\frac{1}{10}$	...	$\frac{1}{5}$	...	$\frac{1}{3}$	...		
0	$7\frac{1}{2}$	$\frac{1}{32}$	...	$\frac{1}{16}$	...	$\frac{1}{8}$	...	$\frac{1}{4}$	...	...		
0	6	$\frac{1}{40}$	...	$\frac{1}{20}$	...	$\frac{1}{10}$	...	$\frac{1}{5}$	$\frac{1}{4}$	...	$\frac{1}{2}$	
0	5	$\frac{1}{48}$	...	$\frac{1}{24}$	$\frac{1}{16}$	$\frac{1}{12}$	$\frac{1}{8}$	$\frac{1}{6}$	...	$\frac{1}{4}$	...	$\frac{1}{2}$
0	4	$\frac{1}{60}$	...	$\frac{1}{30}$	$\frac{1}{20}$	$\frac{1}{15}$	$\frac{1}{10}$	...	$\frac{1}{6}$	$\frac{1}{5}$	$\frac{1}{3}$	...
0	3	$\frac{1}{80}$	...	$\frac{1}{40}$	...	$\frac{1}{20}$	...	$\frac{1}{10}$	$\frac{1}{8}$	...	$\frac{1}{4}$	...
0	2	$\frac{1}{120}$	...	$\frac{1}{60}$	$\frac{1}{40}$	$\frac{1}{30}$	$\frac{1}{20}$	$\frac{1}{15}$	$\frac{1}{12}$	$\frac{1}{10}$	$\frac{1}{6}$	$\frac{1}{5}$
0	1	$\frac{1}{240}$	...	$\frac{1}{120}$	$\frac{1}{80}$	$\frac{1}{60}$	$\frac{1}{40}$	$\frac{1}{30}$	$\frac{1}{24}$	$\frac{1}{20}$	$\frac{1}{12}$	$\frac{1}{10}$
0	$0\frac{1}{2}$	$\frac{1}{480}$	...	$\frac{1}{224}$	$\frac{1}{160}$	$\frac{1}{120}$	$\frac{1}{80}$	$\frac{1}{60}$	$\frac{1}{48}$	$\frac{1}{40}$	$\frac{1}{24}$	$\frac{1}{20}$
0	$0\frac{1}{4}$	$\frac{1}{960}$	...	$\frac{1}{480}$	$\frac{1}{320}$	$\frac{1}{240}$	$\frac{1}{160}$	$\frac{1}{120}$	$\frac{1}{96}$	$\frac{1}{80}$	$\frac{1}{48}$	$\frac{1}{40}$

RULE. For every 4 in farthings, carry 1 to the pence; for every 12 pence, carry 1 to the shillings; and for every 20 in the shillings, carry 1 to the pounds; and carry 1 for every 10 in the pounds as in simple addition.

REASON. In addition of money, 4 in the farthings make 1 in the place of pence; 12 in the place of pence, make 1 in the place of

shillings; and 20 in the place of shillings, make 1 in the place of pounds; and 10 in the units figure of pounds, make 1 in the place of tens.

Examples.

1.

	£	s.	d.
	1479	14	$6\frac{1}{2}$
	7168	17	$4\frac{1}{4}$
	3133	14	$11\frac{1}{2}$
	3171	19	$10\frac{3}{4}$
Ans.	14954	6	$9\frac{1}{2}$
	13474	12	$2\frac{1}{4}$
Proof	14954	6	$9\frac{1}{2}$

2.

	£	s.	d.
	3768	11	$8\frac{1}{2}$
	1313	16	$5\frac{3}{4}$
	1972	11	$10\frac{1}{2}$
	3168	16	$5\frac{1}{2}$
Ans.	10223	16	6
	6455	4	$9\frac{1}{2}$
Proof	10223	16	6

3.

	£	s.	d.
	16437	19	$11\frac{3}{4}$
	94321	10	$5\frac{1}{2}$
	61427	17	$8\frac{1}{4}$
	58654	12	$11\frac{1}{2}$
Ans.	230842	1	1

4.

	£	s.	d.
	1523	17	$2\frac{1}{2}$
	3456	18	$7\frac{1}{4}$
	6543	12	$1\frac{3}{4}$
	1234	15	$6\frac{1}{4}$
	6543	12	$7\frac{3}{4}$
Ans.	19302	16	$1\frac{1}{2}$

Application.

5. William Russell, Esq., of Brancepeth Castle, is going to the Continent, and wishing to have his bills settled, calls on his steward, who lays the following accounts before him:—The draper's account, 123*l.* 19s.; the brewer's ditto, 41*l.* 10s.; the butcher's, 212*l.* 12s. 6d.; the baker's, 24*l.* 0s, 6d.; the chandler's, 13*l.* 8s. 0d.; architect's, 137*l.* 9s. 9d.; doctor's, 74*l.* 13s. 6d.; coach builder's, 214*l.* 16s. 6d.; wine merchant's, 62*l.* 12.; confectioner's, 16*l.* 2s.; rent, 86*l.* 2s.; servants' wages, 46*l.* 1s.; he wants also to defray the expences of his journey, 330*l.* 12s. 1d., how much must he draw from his banker to settle the whole? *Ans.* 1283*l.* 18s. 10d.

6. I owe Messrs. J. J. and R. Ferens as follows, viz.:—for tea, 13*l.* 10s.; cheese, 17*l.* 13s. 5d.; cotton, 208*l.* 17s.; chintz, 86*l.* 9d.; a former bill, 300*l.*; factorage, 15*l.* 17s. $3\frac{3}{4}$d.; broad cloth, 30*l.* 10s. $4\frac{1}{2}$d.; what do I owe them in all? *Ans.* 672*l.* 8s. $10\frac{1}{2}$d.

7. A lace merchant purchased goods to the amount of 1468*l.* 16s. 7d.; he paid freight, 27*l.* 7s. 6d.; other charges, 23*l.* 14s. $7\frac{1}{2}$d.; and he gained by the sale of his goods, 348*l.* 19s. $6\frac{1}{2}$d.; how much was the amount of the sales? *Ans.* 1868*l.* 18s. 3d.

Troy Weight.

RULE. For every 24 grains, carry 1 to the pennyweights; for every 20 pennyweights, carry 1 to the ounces; and for every 12 ounces, carry 1 to the pounds; and carry 1 for every 10 in the pounds, as in simple addition.

Examples.

8.				9.				10.			
lb.	oz.	dwts.	gr.	lb.	oz.	dwts.	gr.	lb.	oz.	dwts.	gr
4712	11	19	17	163	10	15	13	4763	9	13	17
3714	10	17	15	971	11	14	16	5236	11	19	16
9713	11	13	14	316	10	13	17	4273	7	13	13
3174	10	17	12	941	10	11	13	3412	5	12	14

Application.

11. Bought 3 dozen of silver spoons, weighing 5 lb. 9 oz. 8 dwts.; a teapot, weighing 3 lb. 2 oz. 16 dwts. 16 grs.; two salvers, weighing 4 lb. 6 oz. 17 dwts,; a dozen silver forks, weighing 1 lb. 8 oz. 19 dwts. 22 grs., what was the weight of all these articles?

Ans. 15 lb. 4 oz. 1 dwt. 14 grs.

12. In a service of plate there were 20 dishes, weighing 203 oz. 8 dwt.; 36 plates, weighing 408 oz. 9 dwts.; 5 dozen spoons, weighing 112 oz. 8 dwts.; 12 salts, weighing 71 oz. 7 dwts.; knives and forks, weighing 73 oz. 5 dwts.; two large cups and a tankard, weighing 121 oz. 7 dwts.; with sundry articles, weighing 105 oz. 5 dwts., what was the weight of the whole?

Ans. 91 lb. 3 oz. 9 dwts.

Avoirdupois Weight.

RULE. For every 16 drams, carry 1 to the ounces; for every 16 ounces, carry 1 to the pounds; for every 28 lb, carry 1 to the quarters; for every 4 quarters, carry 1 to the hundreds; for every 20 hundreds, carry 1 to the tons; and the tons as in simple addition.

Examples.

13.				14.			15.		
tons	cwt.	qr.	lb.	cwt.	qr.	lb.	lb.	oz.	dr.
3746	17	3	14	134	3	17	1376	11	15
1373	14	1	17	131	2	18	1314	10	11
1468	13	3	15	147	1	17	3715	11	14
1313	11	1	19	914	2	17	1123	10	13

Application.

16. Bought 5 bags of hops, the first weighed 2 cwt. 3 qrs. 13 lb; the second, 2 cwt. 2 qrs. 11 lb.; the third, 2 cwt. 3 qrs. 5 lb.; the fourth, 2 cwt. 3 qrs. 12 lb.; the fifth, 2 cwt. 3 qrs. 15lb.; what was the weight of the whole? *Ans.* 14 cwt.

17. A grocer bought 6 hhds. of sugar; the first weighed 5 cwt. 3qrs. 27lb.; the second, 4cwt. 1qr. 19lb; the third, 6cwt. 2qrs. 20lb.; the fourth, 3 cwt. 3 qrs. 22 lb.; the fifth, 7 cwt. 1 qr. 11 lb.; and the sixth, 4 cwt. 3 qrs. 17 lb.; what was the weight of all?

Ans. 33 cwt. 1 qr. 4 lb.

Apothecaries' or Chemists' Weights.

RULE. For every 20 grains, carry 1 to the scruples; for every 3 scruples, carry 1 to the drachms; for every 8 drachms, carry 1 to the ounces; for every 12 ounces, carry 1 to the pounds; and the pounds as in simple addition.

Examples.

18.				19.				20.			
lb.	oz.	dr.	sc.	lb.	oz.	dr.	sc.	lb.	oz.	dr.	sc.
174	10	7	1	11	11	5	1	19	11	4	1
10	11	5	1	12	11	4	2	14	10	5	2
11	10	6	2	17	10	5	1	15	11	2	1
9	6	1	1	13	11	6	2	14	10	7	1
4	5	4	1	17	10	5	1	17	8	5	2
14	1	3	2	12	11	4	1	18	4	4	1

Application.

21. A chemist mixed 5 ingredients; the first weighed 13 lb. 7 oz.; the second, 11 oz. 7 drs. 13 grs.; the third, 7 lb. 0 drs. 2 scrs.; the fourth, 11 lb. 3 drs. 1 scr.; the fifth, 15 lb. 5 oz. 7 grs.; what was the weight in all? *Ans.* 48 lb. 3 drs. 1 scr.

Liquid Measure.

RULE. For every 4 gills, carry 1 to the pints; for every 2 pints, carry 1 to the quarts; for every 4 quarts, carry 1 to the gallons; for every 63 gallons, carry 1 to the hogsheads; for every 4 hogsheads, carry 1 to the tuns; and the tuns as in simple addition.

Examples.

22.					23.						24.					
hhd.	gal.	qt.	pt.	g.	tun.	hhd	gal.	qt.	pt.	g.	tun.	hhd.	gal.	qt.	pt.	g.
31	57	1	1	2	37	3	27	2	1	1	39	2	14	1	1	3
19	17	3	1	3	17	2	60	1	1	3	40	1	57	3	1	2
17	39	2	1	1	39	1	58	1	1	2	99	1	53	2	1	3

Application.

25. Bought 3 casks of Scotch malt, the first contained 44 gals. 3 qts. 1 pt. 3 gls.; the second contained 37 gals. 2 qts. 0 pt. 3 gls.; and the third measured 61 gals. 3 qts. 1 pt. 2 gls.; what did the whole contain? *Ans.* 144 gals. 2 qts.

NOTE. One gallon of water, weighs 10 lb. Avoirdupoise; a pint weighs $1\frac{1}{4}$ lb.; and a bushel weighs 80 lb.

Dry Measure.

RULE. For every 2 pints, carry 1 to the quarts; for every 4 quarts, carry 1 to the gallons; for every 2 gallons, carry 1 to the pecks; for every 4 pecks, carry 1 to the bushels; and for every 8 bushels, carry 1 to the quarters; and the quarters as in simple addition.

Examples.

26.

qrs.	b.	p.	g.
37	1	3	3
60	0	1	2
14	1	2	3
15	1	3	1

27.

b.	p.	g.	q.	pt.
27	3	1	1	1
26	2	0	0	0
23	3	1	0	1
13	3	1	1	1

28.

b.	p.	g.	q.	pt.
31	2	1	1	0
17	1	1	0	1
20	1	1	1	0
37	1	1	1	1

Application.

29. Messrs Losh Wilson & Bell, of Newcastle, consigns to their correspondent at Hamburgh, on the 1st of January, 1847, 27 qrs. 6 b. 3 p. of Wheat; on the 10th, 38 qrs. 4 b. 2 p.; on the 14th, 49 qrs., 6 b.; and on the 20th of the same month, 58 qrs. 7 b. 3 p., how much did they export during the month?

Ans. 175 qrs. 1 b. 0 p.

Cloth Measure.

RULE. For every 4 nails, carry 1 to the quarters; for every 4 quarters, carry 1 to the yards; for every 5 quarters, carry 1 to the ells English; and for every 6 quarters, carry 1 to the ells French.

Examples.

30.

yds.	qr.	na.
36	3	1
37	1	1
14	1	2
15	2	3

31.

yds.	qr.	na.
374	1	2
397	2	3
462	3	1
314	2	3

32.

e. e.	qr.	na.
421	2	2
123	1	3
210	2	3
121	1	2

33.

e. f.	qr.	na.
312	2	2
123	2	6
314	1	2
101	2	2

Application.

34. A merchant received seven bales of Linen;—the first contained 72 yds. 1 qr. 2 na.; the second, 20 yds. 3 na.; the third 100 yds.; the fourth, 36 yds. 3 na.; the fifth, 46 yds. 2 na.; the sixth, 71 yds. 2 qr. 1 na.; and the seventh, 46 yds. 1 qr. 2 na.; how many yards were in all? *Ans.* 392 yds. 3 qr. 1 na.

Long Measure.

RULE. For every 3 barleycorns, carry 1 to the inches; for every 12 inches, carry 1 to the feet; for every 3 feet, carry 1 to the yards; for every 5½ yards, carry 1 to the poles English; for every 7 yards, carry 1 to the perches Irish; for every 40 poles, carry 1 to the furlongs; for every 8 furlongs, carry 1 to the miles; for every 3 miles, carry 1 to the leagues; for every 69½ miles, carry 1 to the degrees; and the degrees as in Simple Addition.

Examples.

35.			36.			37.			38.					
ml	fur.	per.	yds.	fur.	per.	ml.	fur.	per.	ml.	fur.	yds.	f.	in.	b.
27	5	37	176	1	6	4	6	20	177	7	6	1	10	2
19	6	36	178	2	8	6	5	13	197	6	5	2	11	1
14	7	16	197	2	10	7	4	9	189	5	6	1	10	1
13	5	20	101	1	11	6	7	12	214	1	5	2	11	1

Application.

39. James rode 35 mls. 2 fur. 34 per. on Monday; walked 24 mls. 6 fur. 25 per. 2 yds. on Tuesday; he rode, on Wednesday, 42 mls. 7 fur. 4 yds.; and walked on Thursday, 15 mls. 4 fur. 38 per. 3 yds., what distance did he travel in the 4 days?

Ans. 118 mls. 5 fur. 18 per. 3½ yds.

Solid Measure.

RULE. For every 1728 solid inches, carry 1 to the feet; for every 27 solid feet, carry 1 to the yards; and for every 343 solid yards, carry 1 to the perches; and perches as in Simple Addition.

Examples.

40.				41.				42.			
per.	yds.	ft.	in.	per.	yds.	ft.	in.	per.	yds.	ft.	in.
374	130	14	150	176	126	23	1711	312	19	17	13
371	176	24	140	314	141	17	1314	164	26	23	14
914	68	20	13	431	19	25	1711	726	17	11	18

Square or Land Measure.

RULE. For every 144 square inches, carry 1 to the square feet; for every 9 square feet, carry 1 to the square yards; for every 49 square feet, carry 1 to the square perches or poles; for every 40 square perches or poles, carry 1 to the acres; and the acres as in Simple Addition.

Examples.

43.

a.	r.	p.	yds.	ft.	in.
147	1	27	33	7	78
192	2	16	38	4	101
141	3	39	16	6	140
175	2	28	39	2	132

44.

a.	r.	p.	yds.	ft.	in.
2376	2	16	12	2	140
1942	3	32	17	7	111
1723	2	18	32	6	78
1115	3	19	39	8	132

Astronomical Time.

RULE. For every 60 seconds, carry 1 to the minutes; for every 60 minutes, carry 1 to the hours; for every 24 hours, carry 1 to the days; for every 7 days, carry 1 to the weeks; for every 4 weeks carry 1 to the months; for every 12 months, carry 1 to the years; and for every 52 weeks, carry 1 to the years; for every $365\frac{1}{4}$ days, carry 1 to the years; and the years as in Simple Addition.

Examples.

45.

w.	d.	h.	m.	s.
27	4	18	37	56
37	6	19	50	51
31	4	18	51	40

46.

degs.	′	″	‴	⁗
176	30	50	41	25
195	21	47	46	21
197	5	43	51	27

CHAPTER VIII.

COMPOUND SUBTRACTION.

COMPOUND SUBTRACTION teaches to find the difference between any two numbers of different denominations.

RULE. Place the lesser number under the greater; begin at the right hand to subtract and set down the remainder. The method of proof is the same as in Simple Subtraction.

Examples in Coin.

	1.			2.			3.			4.		
	£.	s.	d.	£.	s.	d.	£.	s.	d	£.	s.	d.
From	10	13	$6\frac{1}{2}$	19	17	$4\frac{3}{4}$	135	17	$4\frac{1}{2}$	176	13	$10\frac{1}{2}$
Take	11	7	$4\frac{1}{2}$	11	10	$2\frac{1}{4}$	94	16	$1\frac{3}{4}$	57	18	$6\frac{1}{4}$

	5.			6.			7.			8.		
	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
From	1000	0	2	100	13	4	136	17	$2\frac{1}{4}$	746	18	$3\frac{1}{2}$
Take	999	19	$11\frac{3}{4}$	99	16	$8\frac{1}{2}$	76	19	$9\frac{1}{2}$	76	19	$8\frac{3}{4}$

NOTE. When the lower farthings are greater, borrow from 4, add the remainder to the lesser, and carry 1 to the pence; when the lower pence is higher, borrow from 12, adding the remainder to the lesser, and carry 1 to the shillings; when the shillings are lower, borrow from 20, adding the remainder to the lesser, carry 1 to the pounds, and the pounds as in Simple Subtraction.

Troy Weight.

RULE. When the lower grs. are greater, borrow from 24, adding the remainder to the upper, and carry 1 to the dwts.; when the lower dwts. are greater, borrow from 20, adding 1 to the oz.; when the lower ozs. are greater, borrow from 12, and carry 1 to the lbs. and subtract the lbs. as in Simple Subtraction.

Examples.

	9.				10.				11.			
	lbs.	oz.	dwts.	grs.	lbs.	oz.	dwts.	grs.	lbs.	oz.	dwts.	grs.
From	5	6	13	14	374	11	12	6	197	11	13	13
Take	3	4	6	8	279	10	17	8	178	10	17	10

Avoirdupois Weight.

RULE. When the lower drs. are greater, borrow from 16, and carry 1 to the oz.; when the lower oz. are greater, borrow from 16, and carry 1 to the lbs.; when the lower lbs. are greater, borrow from 28, and carry 1 to the qrs.; when the lower qrs. are greater, borrow from 4, and carry 1 to the cwts.; when the lower cwts. are greater, borrow from 20, and carry 1 to the tons.; observing in each case to add the remainder to the upper number; and the tons as in Simple Subtraction.

Examples.

	12.					13.						14.					
	cwt.	qr.	lb.	oz.	dr.	t.	cwt.	qr.	lb.	oz.	dr.	t.	cwt.	qr.	lb.	oz.	dr.
From	17	3	14	6	14	16	16	2	14	13	14	23	17	3	19	12	12
Take	12	1	8	4	8	12	17	3	19	15	15	17	18	3	23	13	13

Chemists' Weight.

RULE. When the lower grs. are greater, borrow from 20, and carry 1 to the scruples; when the lower scruples are greater, borrow from 3, carry 1 to the drams; when the lower drams are greater, borrow from 8, carry 1 to the ounces; when the lower ounces are greater, borrow from 12, and carry 1 to the lbs.; and the lbs. as in Simple Subtraction.

Examples.

	15.					16.					17.				
	℔	ʒ	ʒ	℈	gr.	℔	ʒ	ʒ	℈	gr.	℔	ʒ	ʒ	℈	gr.
From	19	8	7	2	19	24	6	5	1	16	27	5	6	1	17
Take	15	6	5	1	16	19	8	7	2	19	23	7	7	1	19

Liquid Measure.

RULE. When the lower pints are greater, borrow from 2, and carry 1 to the quarts; when the lower quarts are greater, borrow from 4, and carry 1 to the gallons; when the lower gallons are greater, borrow from 63, and carry 1 to the hogsheads; when the lower hogsheads are greater, borrow from 4, and carry 1 to the tuns; and the tuns as in Simple Substraction.

Examples.

	18.					19.					20.				
	t.	h.	g.	q.	p.	t.	h.	g.	q.	p.	t.	h.	g.	q.	p.
From	140	3	56	2	1	163	2	56	1	0	176	3	23	1	1
Take	131	2	50	1	1	94	3	61	1	1	100	3	39	1	1

Dry Measure.

RULE. For every 2 pints, carry 1 to the quarts; for every 4 quarts, carry 1 to the gallons; for every 2 gallons, carry 1 to the pecks; for every 4 pecks, carry 1 to the bushels; for every 8 bushels, carry 1 to the quarters; and the quarters as in Simple Subtraction.

Examples.

	21.							22.							23.						
	qrs.	b.	p.	g.	q.	p.		qrs.	b.	p.	g.	q.	p.		qrs.	b.	p.	g.	q.	p.	
From	136	7	3	1	3	1		204	6	2	0	2	0		311	6	3	1	3	1	
Take	52	2	1	0	2	0		19	6	3	1	1	1		204	7	2	1	3	1	

A new Table, shewing the number of days between any two given times.

EXPLANATION. To find the number of days from the 1st of January till the 11th July. To the right hand of July you will find 181 days, to which add the 11 days of July, and you have 192, the number of days required.

24. How many days from the 9th May till the 17th September? Opposite May in the column you will find 120, to which add 9=129. Opposite September you will find 243 to which add 17=260. Then from 260 take 129, the remainder will be 131, the number of days sought.

Table.

31	334	January	00	31
59	306	February	31	28
90	275	March	59	31
120	245	April	90	30
151	214	May	120	31
181	184	June	151	30
212	150	July	181	31
243	122	August	212	31
273	92	September	243	30
304	61	October	273	31
334	31	November	304	30
365	00	December	334	31

25. How many days from the 5th November, 1846, till the 16th May, 1847?

Add 25, compliment of 5 to 30 (days in November) to 31 found on the left hand of November, and to that sum add 120 found opposite May—more 16 for May, and you have 192, the days required. Enough has been said to render this table quite explanatory.

To ascertain the length of the day and night at any time of the year.

THIS IS THE RULE. Double the time of the Sun's rising, which gives the length of the night, and double the time of setting, which gives the length of the day.

Examples.

26. The Prince of Wales was born on the 9th of November, 1841, what was the length of the day and night, the Sun rose at 7.10, and set at 4.50.

Sun set 4.50	Rose 7.10	Day 9.40
2	2	Night 14.20
Length of day 9.40	Length of night 14.20	Proof 24.0

Time.

RULE. When the seconds in the under line are greater, borrow from 60, and carry 1 to the minutes; when the minutes in the said line are greater, borrow from 60, and carry 1 to the hours; when the hours in the same line are greater, borrow from 24, and carry 1 to the days; when the days are greater, borrow from 7, and carry 1 to the weeks; when the weeks are greater, borrow from 4, and carry 1 to the months; when the months are greater, borrow from 12, and carry 1 to the years, adding the remainder in every case to the upper number; and the years the same as in Simple Subtraction.

Examples.

	27.				28.							29.						
	y.	m.	w.	d.	y.	m.	w.	d.	h.	m.	s.	y.	m.	w.	d.	h.	m.	s.
From	1741	8	2	3	6542	6	3	5	13	40	20	56	7	3	4	9	20	10
Take	1532	9	3	5	4765	9	3	6	18	54	37	37	9	1	6	10	30	21

Square or Land Measure.

RULE. When the lower feet exceed the upper, borrow from 9, and carry 1 to the yards; when the lower yards are greater, borrow from 49, and carry 1 to the poles or perches; when the poles in the lower line exceed the upper, borrow from 40, and carry 1 to the roods; when the roods in the lower line are greater, carry 1 to the acres; and the acres as in Simple Subtraction.

Examples.

	30.					31.				
	a.	r.	p.	y.	f.	a.	r.	p.	y.	f.
From	100	2	36	16	7	114	1	21	15	16
Take	97	1	30	14	5	74	2	36	16	0

Cloth Measure.

RULE. In the nails borrow from 4, and carry 1 to the quarters; in the quarters, borrow from 4, and carry 1 to the yards; and the yards as in whole numbers,—but observe in all cases to add the remainder to the upper number.

Examples.

	32.				33.			34.			
	e.e.	yd.	qr.	na.	yd.	qr.	na.	e.e.	yd.	qr.	na.
From	73	2	1	2	96	1	1	127	1	2	1
Take	29	0	1	0	48	2	2	67	2	2	3

Long Measure.

RULE. In the barley-corns, borrow from 3, and carry 1 to the inches; in the inches, borrow from 12, and carry 1 to the feet; in the feet, borrow from 3, and carry 1 to the yards; in the yards, borrow from 7 Irish and from 5½ English, and carry 1 to the perches; in the perches, borrow from 40, and carry 1 to the furlongs; in the furlongs, borrow from 8, and carry 1 to the miles.

Examples.

	35.				36.				37.			
	m.	f.	p.	y.	y.	ft.	in.	b.	m.	f.	p.	y.
From	19	3	36	3	212	2	10	2	116	6	5	3
Take	12	5	38	2	114	1	11	1	110	7	3	4

CHAPTER IX.

COMPOUND MULTIPLICATION.

COMPOUND MULTIPLICATION teaches to find the amount of any number of divers denominations repeated a number of times.

RULE. Begin to multiply the lowest denomination by the quantity, reduce it to the next higher, carry as many of the higher as it contains, to the next, and so proceed from one denomination to another, till all be done.

Examples.

CASE 1.

	1.				2.				3.			
	£	s.	d.		£	s.	d.		£	s.	d.	
2 yards at	1	12	6½	per yd.	13	12	9¾	by 9	14	13	7¼	by 7
			2				9				7	
	£ 3	5	1	*Ans.*	£122	15	3¾	*Ans.*	£102	15	2¾	*Ans.*

4. 4 yards of cloth, at 17s. 6½d. per yard. *Ans.* 3*l.* 10s. 2d.
5. 5 cwt. of sugar, at 3*l.* 0s. 6d. per cwt. *Ans.* 15*l.* 2s. 6d.
6. 7 yards of linen, at 7s. 10d. per yd. *Ans.* 2*l.* 14s. 10d.
7. 10 gallons of rum, at 12s. 10d. per gal. *Ans.* 6*l.* 8s. 4d.
8. 11 lbs. of tea, at 6s. 10½d. per lb. *Ans.* 3*l.* 15s. 7½d.
9. 12 cwt. of butter, at 1*l.* 17s. 6¾d. per cwt. *Ans.* 22*l.* 10s. 9d.

Case 2.

If the number be composite, multiply the price by one of the components, and that product by the other, and you will have the amount.

Examples.

10.

16 cwt. of Russian tallow, at £ 1 s. 18 d. 8 per cwt.
4
7 14 8
4
£30 18 8 *Ans.*

11.

14 cwt. at s. 6 d. $7\frac{3}{4}$ per cwt.
2
13 $3\frac{1}{2}$
7
£4 13 $0\frac{1}{2}$ *Ans.*

12. 72 cwt., at 15s. 9d. per cwt. *Ans.* 56*l.* 14s.
13. 96 cwt., at 1s. $10\frac{3}{4}$d. per cwt. *Ans.* 9*l.* 2s. 0d.
14. 100 cwt., at 10s. 10d. per cwt. *Ans.* 54*l.* 3s. 4d.
15. 144 cwt., at 1s. $7\frac{1}{2}$d. per cwt. *Ans.* 11*l.* 14s. 0d.

Case 3.

If the quantity be not a composite number,—

This is the Rule. Multiply the nearest composite you can find; if more, subtract; but if less, add so many times the price of one for the amount.

Examples.

16.

75 yards, at s. 6 d. $9\frac{3}{4}$ per yd.
9
3 1 $3\frac{3}{4}$
8
24 10 6
1 0 $5\frac{1}{4}$ price of three.
£ 25 10 $11\frac{1}{4}$ *Ans.*

or thus,

17.

s. 6 d. $9\frac{3}{4}$
11
3 14 $11\frac{1}{4}$
7
26 4 $6\frac{3}{4}$
0 13 $7\frac{1}{2}$ take 2 off
£ 25 10 $11\frac{1}{4}$ *Ans.*

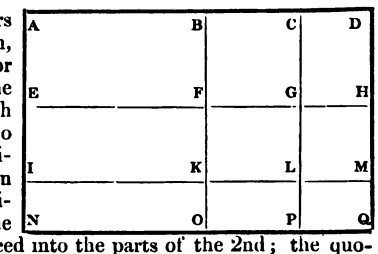
18. 46 yards, at 4s. 7½d. per yard. *Ans.* 10*l.* 11s. 9½d.
19. 79 yards, at 7s. 10d. per yard. *Ans.* 30*l.* 18s. 10d.
20. 94 yards, at 12s. 2d. per yard. *Ans.* 57*l.* 3s. 8d.
21. 117 yards, at 1*l.* 2s. 3d. per yard. *Ans.* 130*l.* 3s. 3d.

Problem.

To Multiply pounds, shillings, and pence, by pounds, shillings, and pence.

This is the Rule. Pounds × by pounds, produce pounds. Pounds × by shillings, every 20 is a pound, the rest shillings. Pounds × by pence, every 12 is a shilling, and the rest pence. Shillings × by shillings, every 20 is a shilling, every 5 is threepence, and each 1 is two farthings and four-tenths of a farthing. Shillings × by pence, every 5 is a farthing, and each 1, two-tenths of a farthing. Pence × by pence, every 60 is a farthing, and every 6, one-tenth of a farthing.

The following Diagram will more fully illustrate this new and beautiful Rule, which may be applied in the multiplication of feet, inches, and parts, and also in the multiplication of cwts., qrs., and lbs., by cwts., qrs., and lbs.



Let there be two numbers of three denominations given, and let A. F. be the square or the rectangle, made of the greatest denomination in both numbers, E. K. and B. G. two rectangles, made by multiplying the 1st denomination by the 2nd; the product divided by an integer of the greatest denomination reduced into the parts of the 2nd; the quotient shall be of the same name with the greatest, and the remainder of the same name with the 2nd.

2. F. L. is the square of the 2nd denomination, which being divided by an integer of the greatest, reduced into the parts of the 2nd, the quotient shall be of the same denomination with the 2nd; and if there be a remainder, it must be multiplied by a number, which, in the 3rd denomination is equal to an integer in the 2nd, the quotient shall be of the 3rd denomination; and if there be still a remainder, it must be multiplied by a number, which, in the 4th denomination is equal to an integer in the 3rd, and divided as before, the quotient will be of the 4th denomination, and so on till

the remainder cannot be reduced to any lower terms. And thus you have the square or rectangle A. C. I. L.

3. C. H. and I. O. are two rectangles made by the multiplication of the sum of the greatest denomination given, by the sum given, which is of the 3rd lower denomination; the product shall be of the same denomination with the 3rd; and therefore if that product be greater than an integer of the 2nd denomination, reduced into the parts of the 3rd, it must be divided by a number, which, in the 3rd denomination is equal to an integer in the 2nd, the quotient shall be of the 2nd denomination, and the remainder of the 3rd.

4. G. M. and K. P. are two rectangles made by multiplying the sum of the 2nd denomination by the 3rd, and the product being divided by one of the integers in the greatest denomination, reduced into the parts of the 2nd, the quotient shall be of the same denomination with the 3rd, and the remainder must be multiplied by a number, which, in the 4th denomination is equal to an integer; in the 3rd, the quotient shall be of that 4th denomination. and the remainder shall be the number of a fraction, whose denominator is that former divisor.

5. L. Q. is the square of the 3rd denomination, which must be divided by one integer of the greatest denomination, reduced into the parts of the 3rd, the quotient shall be of the 4th lesser denomition, and the remainder shall be the numerator of a fraction, whose denominator is the same divisor.

Examples.

22. Multiply 3*l.* 5s. 6d. by 2*l.* 12s. 9d.

Explanation.

First, I say, 2*l.* by 3 make 6*l.*; 2ndly, 2*l.* by 5s. is 10, and 3*l.* by 12s. is 36, whose sum is 46, which, by the 2nd direction will be 2*l.* 6s.; 3rdly, 2*l.* by 6d. is 12, and 3*l.* by 9d. is 27, whose sum is 39, which, by direction the 3rd, will be 3s. 3d.; 4thly, 12s. by 5s. is 60, which, by direction the 4th, will be 3s.; 5thly, 12s. by 6 is 72, and 5s. by 9d. is 45, whose sum is 117, which, by direction the 5th, will be $5\frac{3}{4}$d. and four-tenths; 6thly, 6d. by 9d, is 54, which, by direction the 6th, will be nine-tenths. Add the whole, and you will find 8*l.* 12s. $9\frac{3}{10}$d., as required.

Operation.

£	s.	d.	
3	5	6	
2	12	9	
6			
2	6		
	3	3	
	3		
		$5\frac{3}{4}\frac{4}{10}$	
		$\frac{9}{10}$	
£8	12	$9\frac{3}{10}$	*Ans.*

23. Multiply 2s. 6d. by 2s. 6d., a pound being taken for the integer.

Explanation.

2s. by 2s. make 2d. 1 far. and 6-tenths; 2s. by 6d. make 12, and 2s. by 6 make 12, the sum is 24 = to 1d. 0 far. and 8-tenths; finally, 6d. by 6d. make 36 equal to 6-tenths, which three numbers added together, produce 3¾d., the product.

Operation.

s.	d.	f.	tenths.
2	6		
2	6		
	2	1	6
	1	0	8
			6
	3¾d.		*Ans.*

A further proof of the above by Decimals.

24. 2s. 6d., or $\frac{1}{8}$ of a pound is .125

.125

626

250

125

.15626=3¾d. *Ans.*

Further proof by Vulgar Fractions.

25. Multiply $\frac{1}{8}$ of a pound,
by $\frac{1}{8}$ of a pound.

$\frac{1}{64}$ of a pound=3¾d., as required.

The above question was given in the first Edition of this work, and finding so few, who could be brought to understand it, the author has entered more fully into it. To those who still stumble at the problem, he begs to refer them to the first and second book of Euclid's Elements.

26. Multiply 2s. 6d. by 2s. 6d., the integer being a shilling.

THIS IS THE RULE. Shillings × by shillings produce shillings; shillings × by pence, every 12 is a shilling, the rest pence; shillings × by farthings produce farthings; pence × by pence, every 12 is a penny, and each 3 a farthing.; pence × by farthings, each 12 is a farthing, and every 3 is a quarter of a farthing; farthings × by farthings, each 12 is a quarter of a farthing.

Explanation.

2s. by 2s. make 4s., and 2s. by 6d. is 12, and 2s. by 6d. is 12, and twice 12 make 24, which is 2s.; then 6d. by 6d. is 36=3d., and all added=6s. 3d.

Operation.

s.	d.	
2	6	
2	6	
4	0	
2	0	
	3	
s. 6	3	*Ans.*

The Rule applied in Timber Measure.

Example.

27. A plank 8 ft. 6½ in. long, and 2 ft. 9¾ in. broad; how many feet?

Operation.

ft.	in.	q.
8	6	2
2	9	3
16	0	0
7	0	0
	7	0
	4	2
		3
		$0\frac{1}{8}$
24	0	$1\frac{1}{8}$ *Ans.*

NOTE. This rule may be applied in finding the content of any dimensions in superficial measure.

Examples in Weights and Measures.

28. Multiply 14 lb. 10 oz. 0 dwts. 21 grs. by 4.
Ans. 59 lb. 4 oz. 3 dwts. 12 grs.
29. Multiply 17 tuns 17 cwt. 0 qrs. 24 lb. by 2.
Ans. 35 tun. 14 cwt. 1 qr. 20 lb.
30. Multiply 14 cwt. 0 qrs. 21 lb. 0 oz. 14 drs. by 7.
Ans. 99 cwt. 1 qr. 7 lb. 6 oz. 2 drs.
31. Multiply 10 lb. 6 oz. 4 drs. 1 ℈ 17 grs. by 9.
Ans. 94 lb. 11 oz. 1 dr. 1 ℈ 13 grs.
32. Multiply 127 yds. 0 qrs. 3 na. by 12. *Ans.* 1526 yds. 1 qr.
33. Multiply 120 lea. 7 fur. 24 p. by 5.
Ans. 601 lea. 1 m. 6 fur. 0p.
34. Multiply 46 hhds. 47 gals. 7 pts. by 3.
Ans. 140 hhds. 17 gals. 5 pts.
35. Multiply 365 days 5 hrs. 48 m. 57 sec. by 12.
Ans. 4382 days 21 hrs. 47 m. 24 sec.

CHAPTER X.

COMPOUND DIVISION.

COMPOUND DIVISION is dividing compound numbers into any proposed number of equal parts.

THIS IS THE RULE. Begin to divide the highest denomination, and if any thing remain, you must find how many of the next lower denomination that remainder is equal to, and add them to the next numbers of the same denomination, and so proceed with each denomination till the work be done.

Examples in Coin.

1.				2.				3.			
£.	s.	d.		£.	s.	d.		£.	s.	d.	
2÷225	2	4	by 2.	3÷751	14	$7\frac{1}{2}$	by 3.	4÷821	17	$9\frac{3}{4}$	by 4.
112	11	2	Quot.	250	11	$6\frac{1}{2}$	Quot.	205	9	$5\frac{3}{4}$	Quo.

4. Divide 64*l.* 19s. by 36. *Ans.* 1*l.* 16s. 1d.
5. Divide 37*l.* 14s. 8d. by 48. *Ans.* 15s. $8\frac{1}{2}$d.
6. Divide 190*l.* 4s. 6d. by 42. *Ans.* 4*l.* 10s. 7d.
7. Divide 4567*l.* 0s. 10d. by 55. *Ans.* 83*l* 0s. $8\frac{4}{4}$d.
8. Bought 36 yds. of cloth for 17*l.* 2s., what was it a yard? *Ans.* 9s. 6d.
9. If I pay yearly 96*l.* 16s. for 121 acres of land, what is it per acre? *Ans.* 16s.
10. Six persons purchase 3693 acres of land, what was each man's share? *Ans.* 615a. 2r.
11. Bought 132 lb. of green tea for 74*l.* 16s., how must I sell it so as to neither gain nor lose by the bargain? *Ans.* 11s. 4d.

Weights and Measures.

Examples.

12. Divide 8 lb. 1 oz. 15 dwts. 8 grs. by 2.
Ans. 4 lb. 0 oz. 17 dwt. 16 grs.
13. Divide 24 tons 14 cwt. 0 qr. 14 lb. by 3.
Ans. 8 tons 4 cwt. 2 qrs. $23\frac{1}{3}$ lb.
14. Divide 4 lb. 11 oz. 4 dr. 2 scrs. 12 grs. by 5.
Ans. 11 oz. 7 dr. 1 scr. $2\frac{2}{5}$ oz.
15. Divide 17 cwt. 2 qrs. 27 lb. 14 oz. 15 drs. by 4.
Ans. 4 cwt. 1 qr. 20 lb. 15 oz. $11\frac{3}{4}$ drs.
16. Divide 214 yds. 3 qrs. 2 na. by 9. *Ans.* 23 yds. 3 qrs. 2 na.
17. Divide 12 lea. 2 m. 0 f. 26 p. by 9. *Ans.* 1 lea. 1 m. 1 f. 34 p.
18. Divide 140 a. 2 r. 26 p. by 12. *Ans.* 11 a. 2 r. $35\frac{1}{2}$ p.
19. Divide 146 d. 23 h. 24 m. 56 s. by 6.
Ans. 24 d. 11 h. 54 m. $9\frac{1}{3}$ s.
20. Divide 147 yds. 2 ft. 11 in. by 10.
Ans. 14 yds. 2 ft. 4 in. $2\frac{1}{10}$b.
21. Divide 24 hhd. 57 gal. by 11.
Ans. 2 hhd. 16 gal. 2 pt. 1qt. $\frac{1}{11}$p.
22. Divide 120 e.e. 4 qrs. by 8. *Ans.* 15 e.e. 0 qr. 2 na.
23. Divide 10 tuns 1 p. 1 hhd. 60 gals. 3 qt. by 8.
Ans. 1 tun 0 p. 1 hhd. 31 gals. $0\frac{3}{8}$ qt.

Compendiums.

PROBLEM.

How to find what number of hundreds, pounds, yards, ells, &c., may be bought for any sum of money, the price of one being given in any even number of shillings.

RULE. Annex a cipher to the right hand of the given money, and divide by half the proposed price.

Examples.

24. If 1 lb. of sugar cost 6½d., what is that for 112 lb.?

Ans. 3l. 0s. 0d.

25. How many yards of cloth may be bought for 16*l.*, that is sold at 8s. a yard?

£
4÷160
Ans. 40 yards.

26. How many yards of linen at 6s. per yard can I have for £48?

Ans. 160 yds.

27. How many cwts. of sugar can I have for £80. if it be sold at 36s. per cwt.? *Ans.* 44 cwt. 1 qr. 21 7/9 lbs.

28. How many cwts. of butter at 42s. per cwt. can I buy for £126.? *Ans.* 60 cwt.

Liquid Measure.

PROBLEM.

By knowing the price of a gallon, to find the price of a tun.

THIS IS THE RULE. To the price of a gallon in pence add one-twentieth of itself, and the sum will be the answer.

Examples.

29. If a gallon cost 6s. 3d., what will a tun cost?

20÷75d.
3 15
£78 15s. *Ans.*

30. If 1 gallon of rum cost 14s. 9d., what is the price of a tun?

Ans. 185*l.* 17s.

To reverse this Rule.

From the price of the tun, subtract one-third of one-seventh of the price, and the remainder will be the price of a gallon in pence.

Example.

31. If a tun of spirits cost 78*l.* 15s., what will 1 gallon cost?

£ s.
7÷78 15
3÷11 5
3 15
£75 0 & 75d.=6s. 3d. per gal.

CHAPTER XI.

CALCULATION BY THE DOZEN, OR TWELVE.

New Table of 12, *with its composite numbers.*

For 15	take 1	one-fourth	times 12	For 85	take 7	one-twelfth	times 12
.. 17	 1	five-twelfth	 12	.. 87	 7	one-fourth	 12
.. 19	 1	seven-twelfth	 12	.. 89	 7	five-twelfth	 12
.. 20	 1	two-third	 11	.. 91	 7	seven-twelfth	... 12
.. 21	 1	three-fourth	 12	.. 93	 7	three-fourth	 12
.. 22	 1	eleven-twelfth	... 12	.. 95	 7	eleven-twelfth	.. 12
.. 26	 2	one-sixth	 12	.. 97	 8	one twelfth	 12
.. 28	 2	one-third	 12	.. 99	 8	one-fourth	 12
.. 29	 2	five-twelfth	 12	..101	 8	five-twelfth	 12
.. 31	 2	seven-twelfth	 12	..103	 8	seven-twelfth	 12
.. 33	 2	three-fourth	 12	..105	 8	three-fourth	 12
.. 35	 2	eleven-twelfth	 12	..107	 8	eleven-twelfth	... 12
.. 37	 3	one-twelfth	 12	..109	 9	one-twelfth	 12
.. 39	 3	one-fourth	 12	..111	 9	one-fourth	 12
.. 41	 3	five-twelfth	 12	..113	 9	five-twelfth	 12
.. 43	 3	seven-twelfth	... 12	..115	 9	seven-twelfth	 12
.. 45	 3	three-fourth	 12	..117	 9	three-fourth	 12
.. 47	 3	eleven twelfth	.. 12	..119	 9	eleven-twelfth	... 12
.. 50	 4	one-sixth	 12	..121	10	one-twelfth	 12
.. 52	 4	one-third	 12	..123	10	one-fourth	 12
.. 54	 4	one-half	 12	..125	10	five-twelfth	 12
.. 55	 4	seven-twelfth	 12	..127	10	seven-twelfth	 12
.. 57	 4	three-fourth	 12	..129	10	three-fourth	 12
.. 59	 4	eleven-twelfth	.. 12	..131	10	eleven-twelfth	... 12
.. 61	 5	one-twelfth	 12	..133	11	one-twelfth	 12
.. 63	 5	one-fourth	 12	..135	11	one-fourth	 12
.. 65	 5	five-twelfth	 12	..137	11	five-twelfth	 12
.. 67	 5	seven-twelfth	 12	..139	11	seven-twelfth	 12
.. 69	 5	three-fourth	 12	..141	11	three-fourth	 12
.. 71	 5	eleven-twelfth	... 12	..143	11	eleven-twelfth	... 12
.. 73	 6	one-twelfth	 12	..145	12	one-twelfth	 12
.. 75	 6	one-fourth	 12	..147	12	one-fourth	 12
.. 77	 6	five-twelfth	 12	..149	12	five-twelfth	 12
.. 79	 6	seven-twelfth	 12	..151	12	seven-twelfth	 12
.. 81	 6	three-fourth	 12	..153	12	three-fourth	 12
.. 83	 6	eleven-twelfth	... 12	..155	12	eleven-twelfth	.. 12

NOTE. The above table is to be got off correctly, and when committed to memory the pupil will be able in an instant to tell the amount of any quantity at any price from 12 to 155. This table is original, and constructed to facilitate the calculation of odd numbers, in any case, as far as 12 reaches.

Exercise I.

Given the value of an Integer, either abstract or applicate, thence to determine the value of any proposed number or specie of the same kind, by the dozen or twelve.

This is the Rule. Call the pence which the unit costs shillings, and it is done. But observe, if a half-penny, farthing, or three-farthings be affixed to the price, call the half-penny six-pence, and count three-pence for each farthing.

This general proposition and its reciprocal, exactly envelopes the whole system of Mercantile Arithmetic, and can be briefly analyzed into three particular cases.

First, the number whose value is required, must be either equal, greater, or less than 12. If 12, agreeably to this system, it admits but of one mental infallible rule—if less, of three, and if greater, of four operative ones.

But with respect to the particular cases, observe, that a number less than 12, may be an exact measure of 12, or prime to it; also, a number greater than 12, may be a multiple of 12, or prime to it. Each of these cases will be minutely considered, and carefully arranged under its distinct head; and as 12 is the key to this section, I shall first take it into consideration.

Problem.

By knowing the price of 1, *to know the value of* 12 *of the same kind, as per Rule.—*

Call the pence which the unit costs shillings, and 'tis done; but if a half-penny, farthing, or three-farthings, be affixed to the price; call the half-penny six-pence, the farthing three-pence, and the three-farthings nine-pence, as directed, and this will infallibly give the answer. As an instance—If a pound of sugar cost seven-pence, 12 pounds will cost as many shillings; but if a pound cost 6½d., call the 6d. six shillings, and the half-penny sixpence, and it will be the price of 12 pounds.

Also, If a pound costs 9¼d., call the 9d. nine shillings, and 3d. for the farthing, and you have the price of 12 pounds=9s. 3d.; but if a pound costs 5¾d., call the 5d., five shillings, and count 9d, for the three-farthings, and you have the price of 12 pounds= 5s. 9d.

Finally, if the price per integer, should amount to shillings and pence, &c., reduce the shillings and pence mentally to pence, and call them shillings, and you have the amount of 12, as per rule.

The Reason of this rule is founded on this obvious principle.—When a pound costs 1d., one shilling will be the cost of 12, that is a shilling to the penny. Hence, in general, as many pence as a *pound* costs, as many shillings will 12 pounds cost; also, if a pound

costs a half-penny, 12 pounds will cost six-pence, and if a pound costs a farthing, 12 pounds will cost three-pence, which is evidently the reason of calling the pence shillings, the half-penny six-pence, and three-pence for each farthing.

A few examples will render this exercise sufficiently explanatory, which the learner is imperatively cautioned not to pass over, until he is able to tell, at once, the amount of 12, at any proposed price per integer, which is best effected by having another person to interrogate him as follows:—

1. At 17½d. per yard, what is the value of 12 yards?
Ans. 17s. 6d.

2. At 15¾d. per stone of wheat, what is the value of 12 stones?
Ans. 15s. 9d.

Such queries you are to answer verbatim, as soon as proposed, according to the rule, by allowing a shilling to the penny, six-pence to the half-penny, and three-pence to each farthing, if a half-penny, farthing, or three-farthings occur in the price.

Examples.

3. 12 lb. at 6d. per lb. *Ans.* 6s.
4. 12 lb. at 8d. per lb. *Ans.* 8s.
5. 12 lb. at 13d. per lb. *Ans.* 13s.
6. 12 lb. at 4½d. per lb. *Ans.* 4s. 3d.
7. 12 lb. at 5½d. per lb. *Ans.* 5s. 6d.
8. 12 lb. at 7¾d. per lb. *Ans.* 7s. 9d.
9. 12 lb. at 15½d. per lb. *Ans.* 15s. 3d.
10. 12 lb. at 16½d. per lb. *Ans.* 16s. 6d.
11. 12 lb. at 17¾d. per lb. *Ans.* 17s. 9d.
12. 12 lb. at 19½d. per lb. *Ans.* 19s. 6d.
13. 12 stones at 23½d. per stone. *Ans.* 1*l.* 3s. 6d.
14. 12 stones at 24½d. per stone. *Ans.* 1*l.* 4s. 6d.
15. 12 stones at 25¾d. per stone. *Ans.* 1*l.* 5s. 9d.
16. 13 stones at 3s. 9½d. per stone. *Ans.* 2*l.* 5s. 6d.
17. 12 yards of red baize, at 2s. 6d. *Ans.* 1*l.* 10s. 0d.
18. 12 pounds of salmon, at 2s. 7½d. per lb. *Ans.* 1*l.* 11s. 6d.
19. 12 gallons of ginger wine, at 8s. 9½d. per gallon.
Ans. 5*l.* 5s. 3d.
20. 12 firkins of table beer, at 9s. 6d. per firkin. *Ans.* 5*l.* 14s. 0d.
21. 12 pairs of silk stockings, at 4s. 10d. per pair.
Ans. 2*l.* 18s. 0d.
22. 12 pecks of peas, at 1s. 11¾d. per peck. *Ans.* 1*l.* 3s. 9d.
23. 12 cambric shirts, at 12s. 10½d. per shirt. *Ans.* 7*l.* 14s. 6d.
24. 12 trusses of hay, at 3s. 11½d. per truss. *Ans.* 2*l.* 7s. 3d.

25. 12 dozen of wax candles, at 9s. 8s. per dozen. *Ans.* 5*l.* 16s. 0d.
26. 12 yards of silk velvet, at 16s. 9d. per yard. *Ans.* 10*l*, 1s.
27. 12 dozen buckles, at 4s. 9d. per dozen. *Ans.* 2*l.* 17s.
28. 12 yards of broad cloth, at 17s. 11½ per yard. *Ans.* 10*l.* 15s. 6d.
29. 12 peck loaves, at 2s. 8d. each. *Ans.* 1*l.* 12s.
30. 12 flannel waistcoats, at 2s. 9⅗d. each. *Ans.* 1*l.* 13s. 6d.
31. 12 bushels of pollard, at 2s. 3⅗d. per bushel. *Ans.* 1*l.* 7s. 6d.
32. 12 maps, at 16s. per map. *Ans.* 9*l.* 12s.
33. 12 dressing cases, at 8s. 9⅗d. a piece. *Ans.* 5*l.* 5s. 6d.
34. 12 candlesticks, at 5s. 10¼d. a piece. *Ans.* 3*l.* 10s. 3d.
35. 12 trusses of hay, at 7s. 9d. per truss. *Ans.* 4*l.* 13s.
36. 12 dozen of sherry, at 1*l.* 18s. 9d. per dozen. *Ans.* 23*l.* 5s.

Problem.

By having the amount of twelve, to find the price of one.

This is the Rule. As many shillings as 12 are worth, so many pence will one cost.

Examples.

37. If 12 pigeons cost 8s., what is one worth? *Ans.* 8d.
38. When 12 yards of linen cost 16s., what is the price of one? *Ans.* 1s. 4d.
39. If 12 pairs of stockings cost 4s. 8d., what is that a pair? *Ans.* 4⅔d.
40. Bought 12 gallons of cider for a pound, what is that a gallon? *Ans.* 1s. 8d.
41. Paid 1*l.* 10s. for a dozen of silk kerchiefs, what were they a piece? *Ans.* 2s. 6d.
42. Gave 2*l.* 14s. for 12 yards of kersey, what is that per yard? *Ans.* 4s. 6d.
43. 1200 of oysters at 5*l.*, what is that per hundred? *Ans.* 8s. 4d.
44. 12 geese at 3*l.* 12s., what is that a piece? *Ans.* 6s.
45. 12 ducks at 1*l.* 6s., what is that for one? *Ans.* 2s. 2d.
46. Paid 6*l.* for a dozen of hats, what is that for one? *Ans.* 10s.
47. If I pay 3*l.* 16s. for 12 yards of holland, what is that a yard? *Ans.* 6s. 4d.
48. If I buy a dozen of rose trees for 2*l.* 10s., what is one worth? *Ans.* 4s. 2d.
49. 12 lamps at 3*l.* 9s.. what is that a piece? *Ans.* 5s. 9d.
50. If a dozen of gloves cost 2*l.* 16s., what is that a pair? *Ans.* 4s. 8d.
51. If 12 stocks cost 1*l.* 19s., what is the price of one? *Ans.* 3s. 3d.
52. 12 cloth caps, at 1*l.* 7s., what is that for one? *Ans.* 2s. 3d.

53. 12 baskets of fruit at 1*l.* 15s., what is that a piece?
Ans. 2s. 11d.

54. 12 window blinds cost 4*l.* 18s., what is that for one?
Ans. 8s. 2d.

55. 12 bottles of port wine cost 2*l.* 8s., what is that a bottle?
Aus. 4s.

56. One dozen Champagne cost 5 guineas, what is that a bottle?
Ans. 8s. 9d.

57. 12 pair of candlesticks at 2*l.* 16s., what is that a pair?
Ans. 4s. 8d.

58. 12 hundred of bank pens at 3*l.*, what is that a hundred?
Ans. 5s.

59. * One thousand of quills at 2*l.* 14s., what is that a hundred?
Ans 4s. 6d.

60. A dozen of tent wine at 24s. 6d., what is it a bottle?
Ans. 2s. 0½d.

NOTE. Enough has been said to render this exercise familiar to any capacity.

PROBLEM.

To calculate the amount of any multiple of 12, *or of any number that contains* 12, *evenly, without a remainder, by having the price of the unit of the same kind.*

THIS IS THE RULE. Call the pence which the unit costs shillings, and if there be a half-penny, farthing, or three-farthings, affixed to the pence, call the half-penny 6d., and count 3d. for each farthing, as taught in Rule the first, which multiply by the number of twelves contained in the given number, the result will be the answer.

FOR WHICH, THIS IS THE REASON. When the price of one in pence is called shillings, 'tis the value of 12, and when the value of 12 is multiplied by the number of twelves, the result is the amount of the given number.

61. What is the price of 24 lb. of beef, at 3¾d. per pound?

Write 3s. 9d. for 3¾d., and it is the value of 12 per Rule the first, and this multiplied by 2, the number of twelves contained in the given number, the result will be the answer.

	s.	d.
	3	9
		2
Ans.	7	6

62. What is 24 lb. of cheese worth, at 2s. 6d. per pound?
Ans. 3*l.* 0s. 0d

63. What is 36 lb. of mutton worth, at 4½d. per lb.?
Ans. 13s. 6d

* There are 12 hundred in a thousand raw quills.

64. 72 pounds of lamb, at 9¼d. per lb. *Ans.* 2*l.* 15s. 6d.
65. 24 yards of silk velvet, at 9s. 8¾d. per yard. *Ans.* 11*l.* 13s. 6d.
66. 60 pounds of currants, at 6¾d. per lb. *Ans.* 1*l.* 13s, 9d.
67. 108 pecks of potatoes, at 9½d. per peck. *Ans.* 4*l.* 5s. 6d.
68. 96 parlour locks, at 3s. 7½d. each. *Ans.* 17*l.* 8s. 0d.
69. 48 sets of fire irons, at 5s. 5½d. a set. *Ans.* 13*l.* 2s. 0d.
70. A gross of slates, at 6½d. each. *Ans.* 3*l.* 18s. 0d.
71. 120 pair of gloves, at 2s. 3½d. a pair. *Ans.* 13*l.* 15s. 0d.
72. A gross of silver buttons, at 1s. 1½d. a piece. *Ans.* 8*l.* 2s. 0d.
73. 84 yards of flanders lace, at 7s. 11½d. per yard. *Ans.* 33*l.* 8s. 6d.
74. 120 gallons of rum, at 13s. 10d. per gallon. *Ans.* 83*l.* 0s. 0d.
75. A gross of lemons, at 2¾d. each. *Ans.* 1*l.* 13s. 0d.
76. 72 stones of flour, at 2s. 7¼d. per stone. *Ans.* 9*l.* 7s. 6d.
77. 10 gross of corks, at 4½d. per dozen. *Ans.* 2*l.* 5s. 0d.
78. 60 pound of tobacco, at 3s. 3½d. per lb. *Ans.* 9*l.* 17s. 6d.
79. 1 gross of penknives, at 6s. 6d. per dozen. *Ans.* 3*l.* 18s. 0d.
80. 96 pound of green tea, at 8s. 9d. per lb. *Ans.* 42*l.* 0s. 0d.
81. 2 gross of writing copies, at 8s. 6d. a dozen. *Ans.* 10*l.* 4s. 0d.
82. 132 quarters of barley, at 1*l.* 13s. 9d. per quarter. *Ans.* 222*l.* 15s. 0d.
83. What is 48 lb. of sugar, worth, at 7¼d. per lb.? *Ans.* 1*l.* 9s. 0d.
84. What is 60 lb. of tobacco worth, at 3s. 9½d. per lb.? *Ans.* 11*l.* 7s. 6d.
85. What is 72 lb. of honey worth, at 4¾d. per lb.? *Ans.* 1*l.* 8s. 6d.
86. What is 84 lb. of leather worth, at 3¾d. per lb.? *Ans* 1*l.* 6s. 3d.
87. What is 108 stones of wheat worth, at 17½d. per stone? *Ans.* 7*l.* 17s. 6d.
88. What is 120 stones of oats worth, at 7d. per stone? *Ans.* 3*l.* 10s. 0d.
89. What is 132 stones of barley worth, at 9¼d. per stone? *Ans.* 5*l.* 1s. 9d.
90. What is 144 stone of flax worth, at 4s. 6¼d. per stone? *Ans.* 32*l.* 11s. 0d.
91. What is 240 ounces of spice worth, at 8d. per ounce? *Ans.* 8*l.* 0s. 0d.
92. What is 360 yards of canvass worth, at 7d. per yard? *Ans.* 10*l.* 10s. 0d.

93. What is 480 yards of calico worth, at 9d. per yard?
Ans. 18*l.* 0s. 0d.

94. What is 600 yards of linen worth, at 11d. per yard?
Ans. 27*l.* 10s. 0d.

95. What is 270 lb. of raisins worth, at 5d. per lb.?
Ans. 5*l.* 12s. 6d.

96. What is 840 lb. of cheese worth, at 7d. per lb.?
Ans. 24*l.* 10s. 0d.

97. What is 260 lb. of sugar worth, at 6d. per lb.?
Ans. 6*l.* 10s. 0d.

98. What is 1080 lb. of starch worth, at 7d. per lb.?
Ans. 31*l.* 10s. 0d.

99. What is 1200 lb. of coffee worth, at 8d. per lb.?
Ans. 40*l.* 0s. 0d.

100. What is 1320 yards of stuff worth, at 9d. per yard?
Ans. 49*l.* 10s. 0d.

PROBLEM.

By having the price of one, to know the amount of any number greater than 12, *but prime to it of the same kind, at the same rate per integer.*

FOR WHICH THIS IS THE RULE. Set down the price of 12 mentally, which multiply by the number of twelves contained in the given number, to which add the amount of the prime part; the aggregate will be the amount of the proposed number.

Examples.

101. What is the amount of 25½ stones of wheat, at 17½d. per stone?

0	17	6	*Otherwise*	2	2	6	
		2			5	3¾	Its one-eighth
1	15	0		£1	17	2¼	See Rule for scores.
	2	2¼					
£1	17	2¼ *Ans.*					

102. What is the price of 73½ lb. of butter, at 6½d. per lb.
Ans. 1*l.* 19s. 9¾d.

103. What is the amount of 85 lb. of beef, at 3¼d. per lb.?
Ans. 1*l.* 3s. 0¼d.

104. What is the price of 137 lb. of worsted, at 17½d. per lb.?
Ans. 9*l.* 19s. 9½d.

105. What will 90 lbs. of tobacco come to, at 3s. 6½d. per lb.?
Ans. 15*l.* 18s. 9d.

106. What is the price of 54 stones of flour, at 2s. 3½d. per stone?
Ans. 6*l.* 3s. 9d.

107. What is the amount of 104 yards of broad cloth, at 8s. 6¾d. per yard? *Ans.* 44*l.* 10s. 6d.

108. What is the price of 47 cwt. of fine flour, at 16s. 8½d. per cwt.? *Ans.* 39*l.* 5s 3½d.

109. What is the cost of 76 gallons of rum, at 14s. 8½d. per gallon? *Ans.* 55*l.* 17s. 10d.

110. What is the price of 130 gallons of wine, at 17s. 9¾d. per gallon? *Ans.* 115*l.* 15s. 7d½.

111. What will the yearly rent of a farm containing 52 acres come to, at £1. 3s. 6d. per acre? *Ans.* 61*l.* 2s. 0d.

112. What is the amount of 27⅓ cwt. of sugar, at £2. 12s. 6½d. per cwt.? *Ans.* 72*l.* 4s. 10¾d.

113. What is the price of 127 yards of cambric, at 8s. 9¾d. per yard? *Ans.* 55*l.* 19s. 2¼d.

Problem.

To calculate the amount of any number from 12 *to* 24.

For which this is the Rule. Call the pence, &c. which the Integer costs shillings, which increase by the same part of itself, that the excess is of 12, if the excess be an exact measure of 12, but if prime, add the value of the prime part; the sum will be the value of the proposed number.

Examples.

114. What is the value of 18 lb. of beef, at 5½d. per lb.? *Ans.* 8s. 3d.

115. What is the price of 17 lb. of butter, at 13¼d. per lb.? *Ans.* 18s. 9¼d.

116. What is the amount of 19⅔ stones of flour, at 2s. 5½d. per stone? *Ans.* 2*l.* 7s. 11¼d.

117. What will 23 lb. of tea come to, at 6s. 7½d. per lb.? *Ans.* 7*l.* 12s 4½d.

118. What will 22 lb. of coffee come to, at 1s. 9¾d. per lb.? *Ans.* 1*l.* 19s. 10½d.

119. What will 17 stones of sugar come to, at 6s. 10¾d per stone? *Ans.* 5*l.* 17s. 2¾d.

120. What will 16⅖ yards of cloth come to, at 15s. 6½d. per yard? *Ans.* 12*l.* 16s. 5¼d.

121. What will 14¾ cwt. of sugar come to, at £1. 19s. 7d. per cwt.? *Ans.* 29*l.* 3s. 10½d.

122. What will 13¾ gallons of brandy come to, at 15s. 9½d. per gallon? *Ans.* 10*l.* 17s. 1⅝d.

123. What is the price of 19½ reams of paper, at 7s. 9¾d. per ream? *Ans.* 7*l.* 12s. 4½d.

124. What is the amount of 23½ lb. of leather, at 2s. 3½d. per lb.? *Ans.* 2*l.* 13s. 10½d.

125. What will 20 bolls of potatoes come to, at 3s. 6½d. per boll? *Ans.* 3*l.* 10s. 10d.

PROBLEM.

To calculate the amount of any number less than 12.

THIS IS THE RULE. If the number be a submultiple of 12, take such a part of the price of the unit, written as shillings, as the given number is of 12, but if prime, multiply the price of one by the number, the result will be the answer.

Examples.

126. What is the value of 6 lb. of coffee, at 17½d per lb.?

s.	d.			s.	d.
17	6	As per Rule the first.			
Its ½=8	9		*Otherwise*	1	5½
					6
				s.8	9

127. What is the price of 11 lb. of madder, at 19¼d. per lb.? *Ans.* 17s. 7¾d.

128. What is the price of 10 lb. of worsted, at 2s. 3½d. per lb.? *Ans.* 1*l.* 2s. 11d.

129. Tell the amount of 9 lb. of mace, at 6s. 10½d. per lb.? *Ans.* 3*l.* 1s. 10½d.

130. What will 8 stones of rice come to, at 2s. 5½d. the stone? *Ans.* 19s. 8d.

131. What is the value of 7⅕ yds. of cloth,, at 8s. 9½d. the yard? *Ans.* 3*l.* 5s. 11⅕d.

132. 6 yards of muslin, at 3s. 7¾d. yer yard? *Ans.* 1*l.* 1s. 10½d.

133. What is the price of 5¾ stones of wool, at 16s. 10d. per stone? *Ans.* 4*l.* 16s. 9½d.

134. What is the amount of 4¾ cwt. of iron, at 1*l.* 12s. 10d. per cwt. *Ans.* 7*l.* 15s. 11⅛d.

135. What is the price of 3⅓ cwt. of loaf sugar, at 2*l.* 12s. 6d. per cwt.? *Ans.* 9*l.* 3s. 9d.

136. What will 11⅓ perches of mason work come to, at 3s. 9½d. per perch? *Ans.* 2*l.* 3s. 7¼d.

137. What will the mowing of 10⅔ acres of meadow come to, at 13s. 10d. per acre? *Ans.* 7*l.* 5s. 3d.

PROBLEM.

By having the price of any number of which 12 *is a multiple, to find the price of one of the same kind.*

THIS IS THE RULE. Find how many twelves are in the nnmber of articles; then bring the amount into shillings, and divide by the number of twelves, the result will be price of one in pence.

Examples.

138. Bought 48 pairs of scissors, at 1*l.* 4s., what is that a pair?
Ans. 6d.

139. 72 yards of drab cloth for 3*l.* 6s., what is that a yard?
Ans. 11d.

140 14 yards of ribbon for 1*l.* 15s., what was it per yard?
Ans. 2s. 6d.

141. 48 chair covers for 1*l.* 16s., what was the price of one?
Ans. 9d.

142. 12 dozen of mould candles, for 3*l.* 18s. what is that a pound?
Ans. 6½d.

143. 60 brass finger plates for 7*l.* 10s., what is one worth?
Ans. 2s. 6d.

144. 120 flower-pots for 2*l.*, what is one worth at that rate?
Ans. 4d.

145. 36 work-boxes for 4*l.* 19s., what is the price of one?
Ans. 2s. 9d.

146. 132 arithmetics at 4*l.* 19.s, what is the price of one?
Ans. 9d.

147. 108 pieces of dinner service for 2*l.* 5s., what is that a piece?
Ans. 5d.

148. 96 glass frames for 62*l.* 16s., what is that a piece?
Ans. 13s. 1d.

149. 84 packages value 23*l.* 2s., what is each one worth?
Ans. 5s. 6d.

150. 72 yards of cambric for 16*l.* 10s., what was it a yard?
Ans. 4s. 7d.

151. If a servant's wages be 20*l.* a year, what is that per month?
Ans. 1*l.* 13s. 4d.

PROBLEM.

The value of any number of articles being given not an exact multiple of 12, *to find the value of one.*

THIS IS THE RULE. 1. Call the number of articles pence. 2. If these pence amount to shillings and pence, divide the shillings of the given value by the shillings, and the pence also by the pence. If both the pence and shillings give the same product, that number is the value of one article in pence.

Examples.

152. If I pay 2*l.* 9s. 7d. for 85 lamp glasses, what is the cost of one?

85 glasses as pence=7s. 1d.

2*l* 9s. 7d.=49s. 7d., Divide 49s, by 7s.=7d. price of one lamp.

Divide 7d. by 1d.=7d.

NOTE. Observe the product of both divisions is 7, therefore the value of one lamp is 7d.

153. 107 yards of printed calico for 4*l.* 0s. 3d., what was it per yard?

	s.	d.		s.	d.	s.	d.	s.	d.	
Yards as pence 107=	8	11		8	11÷80	3=9		9		value of 1 yd.
4*l.* 0s. 3d.=80	3									

OBSERVE, that 8 is contained in 80 exactly 10 times; but 11 could not be divided into 3, therefore take one less, and carry the surplus to the pence and divide by 11, and the sum 9s. 9d. is the result; let a similar course be adopted in every other case.

154. Bought at a sale, 42 salvers for 1*l.* 18s. 6d., what was that a piece? *Ans.* 11d. each.

155. Bought 61 sheets of card-board for 1*l.* 0s. 4d., what was 1 worth? *Ans.* 4d.

156. If I pay 1*l.* 4s. 6d. for 98 lemons, what is that for one? *Ans.* 3d.

157. Bought 109 knives for 2*l.* 5s. 5d., what are they a piece? *Ans.* 5d.

158. Fifty flower-pots for 8s. 4d., what is one worth? *Ans.* 2d.

159. Bought 97 hand-screens for 3*l.* 12s. 9d., what was that for each? *Ans.* 9d.

160. Thirty-seven drawing copies 1*l.* 13s. 11d., what is 1 worth? *Ans.* 11d.

161. If 63 squares of glass cost 15s. 9d., what is one worth? *Ans.* 3d.

162. Bought 50 turkey eggs for 1*l.* 0s. 10d., what were they a piece? *Ans.* 5d.

163. If 37 rabbits cost 1*l.* 13.. 11d., what is 1 worth? *Ans.* 11d.

164. If the carriage of 107 tons cost 3*l.* 2s. 5d., what is that a ton? *Ans.* 7d.

165. If the laying of 91 feet of railway cost 3*l.* 0s. 8d., what is that per foot? *Ans.* 8d.

166. If 115 measures of strawberrys cost 4*l.* 15s. 10d., what did 1 cost? *Ans.* 10d.

167. If 83 pickled tongues cost 3*l.* 2s. 3d., what is 1 worth? *Ans.* 9d.

168. If 77 quarts of oil cost 2*l.* 11s. 4d., what is 1 worth? *Ans.* 8d.

169. Bought 127 candlesticks for 5*l.* 5s. 10d., what is the price of one? *Ans.* 10d.

170. If 88 lb. of beef cost 1*l.* 16s. 8d., what is it a pound? *Ans.* 5d.

171. If 113 peaches cost 2*l.* 16s. 6d., what is one worth? *Ans.* 6d.

172. Bought 55 bushels of beans for 2*l.* 10s. 5d., what is that a bushel? *Ans.* 11d.

173. Thirty-five ounces of thread for 1*l.* 3s. 4d., what is that per ounce? *Ans.* 8d.

174. Bought 22 hand-baskets for 18s. 4d., what is that a piece? *Ans.* 10d.

175. 129 Door handles for 4*l.* 16s. 9d., what is that a piece? *Ans.* 9d.

176. Forty nectarines for 13s. 4d., what is that for one? *Ans.* 4d.

177. If 105 padlocks cost 4*l.* 16s. 3d., what is 1 worth? *Ans.* 11d.

178. Thirty-two cards of steel pens for 1*l.* 9s. 4d., what is 1 card worth? *Ans.* 11d.

179. If 71 lb. of sugar cost 1*l.* 9s. 7d., what is it a pound? *Ans.* 5d.

180. If 140 lb. of sugar cost 5*l.* 16s. 8d., what is that a pound? *Ans.* 10d.

Enough has been given to render this exercise explanatory to any capacity.

A FEW MORE ILLUSTRATIONS. When there are a few over or under the dozen, calculate for a dozen, and add or subtract as may be required.

181.	Thirteen at 4d. each.	*Ans.* 4s. 4d.
182.	Fourteen at 5d. each.	*Ans.* 5s. 10d.
183.	Eleven at 6d. each.	*Ans.* 5s. 6d.
184.	Ten at 6d. each.	*Ans.* 5s. 0d.
185.	Nine at 8d. each.	*Ans.* 6s. 0d.
186.	Fifteen at 10d.	*Ans.* 12s. 6d.
187.	Twenty-five at 4d.	*Ans.* 8s. 4d.
188.	Twenty-six at 9d.	*Ans.* 19s. 6d.
189.	Twenty-three at 3d.	*Ans.* 5s. 9d.
190.	Twenty-two at 7d.	*Ans.* 12s. 10d.
191.	Thirty-seven at 1s. 3d.	*Ans.* 46s. 3d.
192.	Thirty-five at 1s. 4d.	*Ans.* 46s. 8d.

CHAPTER XII.

CALCULATION OF LACE.

As this branch of mercantile business varies much in price, and frequently embraces a variety of fractions, often precenting difficulties to both buyer and seller, the following questions will be found quite sufficient to facilitate the accountant in totting up the amount of any quantity with the greatest despatch.

RULE. Apply the dozen as before directed, multiply the numerator of the fraction by 12, divide that result by the denominator, calling the quotient so many pence, which you are to carry to the

pence, taking care to set down the remaining fraction in its proper place, and thus proceed till all be done.

Examples.

1. What is the amount of 2 dozen of Flanders lace, at $16\frac{1}{16}$d. per yard?

Operation.

	s.	d.		s.	d.	
12 yds. at	1	$4\frac{1}{16}$	=	16	$0\frac{3}{4}$	which double for 2 dozen.
				2		
	£	1	12	1	$\frac{1}{2}$	*Ans.*

2. What will $2\frac{1}{2}$ dozen of edging come to at $3\frac{3}{4}$d. per yard?

	s.	d.	
12 at	$3\frac{3}{4}$d. =	3	9
			$2\frac{1}{2}$
	7	6	
	1	$10\frac{1}{2}$	price of $\frac{1}{2}$ doz.
	s. 9	$4\frac{1}{2}$	*Ans.*

3. What is the amount of $5\frac{1}{2}$ dozen of thread lace, at 1s. $10\frac{1}{3\frac{1}{2}}$d. per yard? *Ans.* 6*l.* 1s. $2\frac{1}{16}$d.

4. What will $9\frac{1}{2}$ dozen of figured lace come to, at $9\frac{3}{16}$d. per yard? *Ans.* 4*l.* 7s. $3\frac{3}{16}$d.

5. Tell the amount of $16\frac{1}{4}$ dozen of silk lace, at 5s. $7\frac{3}{4}$d. per yard? *Ans.* 54*l.* 14s. $10\frac{1}{2}$d.

6. What will $23\frac{1}{2}$ dozen of French lace come to, at 2s. $11\frac{5}{16}$d. per yard? *Ans.* 41*l.* 9s. $10\frac{1}{2}$d.

7. If a yard of flowered lace cost 3s. $9\frac{1}{3\frac{1}{2}}$d., what will $27\frac{3}{4}$ doz. come to? *Ans.* 62*l.* 9s. $7\frac{1\frac{3}{4}}{3\frac{1}{2}}$d.

8. If a yard of fancy Brussels lace cost 9s. $10\frac{9}{16}$d., what will $47\frac{1}{4}$ dozen come to? *Ans.* 280*l.* 2s. $0\frac{15}{16}$d.

9. What will $76\frac{3}{4}$ dozen of blond lace come to at 9s. $5\frac{7}{3\frac{1}{2}}$d. per yard? *Ans.* 434*l.* 9s. $6\frac{1\frac{5}{2}}{3\frac{1}{2}}$d.

10. $127\frac{1}{2}$ dozen of fancy wrought lace, at 2s. $1\frac{5}{16}$d. per yard? *Ans.* 165*l.* 7s. $0\frac{3}{8}$d.

11. $325\frac{1}{4}$ dozen of cambric lace, at 9s. $7\frac{3}{3\frac{1}{2}}$d. per yard? *Ans.* 1876*l.* 15s. $10\frac{1\frac{9}{4}}{3\frac{1}{2}}$d.

12. $113\frac{1}{5}$ dozen of kid gloves, at 1s. $11\frac{3}{10}$d. a pair?

Ans. 131*l.* 11s. $9\frac{3}{5}$d.

13. $97\frac{1}{4}$ dozen of silk stockings, at 7s. $3\frac{1}{10}$d. a pair?

Ans. 423*l.* 6*s.* $9\frac{4}{48}$*d.*

14. $143\frac{1}{3}$ dozen of cotton hose, at $7\frac{1}{3}\frac{1}{2}$d. per pair?

Ans. 52*l.* 12s. $7\frac{1}{4}$d.

PROBLEM.

To find the price of a gross, the price of an article being given.

THIS IS THE RULE. Reckon the pence in the price of 1 article as shillings, and the number of pence in these shillings will be the price of a gross in shillings.

REASON. Because, taking the pence in the price as shillings is the same as multiplying by twelve, and taking these shilling as pence again is the same as multiplying by twelve another time, and $12\times 12=144$—one gross.

15. One gross at 4d. each. *Ans.* 48s.
16. One gross at $2\frac{1}{2}$d. each. *Ans.* 30s.
17. One gross at $3\frac{1}{4}$d. each. *Ans.* 39s.
18. One gross at $7\frac{3}{4}$d. each. *Ans.* 93s.
19. One gross at $8\frac{1}{4}$d. each. *Ans.* 99s.
20. One gross at $9\frac{1}{2}$d. each. *Ans.* 114s.
21. One gross at $11\frac{3}{4}$d each. *Ans.* 141s.
22. One gross at $12\frac{1}{4}$d. each. *Ans.* 147s.
23. One gross at $13\frac{1}{2}$d. each. *Ans.* 162s.
24. One gross at $16\frac{1}{2}$d. each. *Ans.* 198s.
25. One gross at $19\frac{1}{4}$d. each. *Ans* 231s.
26. One gross at $23\frac{3}{4}$d. each. *Ans.* 285s.

PROBLEM.

By knowing the price of a gross, to find the price of a yard.

THIS IS THE RULE. Multiply the price of the gross by 10, subtract $\frac{1}{3}$ of the product, and you have the answer in farthings.

Examples.

27. If a gross cost 1*l.* 1s., what will 1 yard cost?

	£.	s.	
	1	1	
		10	
$\frac{1}{3}$	10	10	
	3	10	
	7	0	=7 farthings or $1\frac{3}{4}$d. *Ans.*

28. If a gross cost 2*l.* 2s., what will a yard cost?

£.	s.
2	2
	10
$\frac{1}{3}$÷21	0
7	0
Ans. 14	0=14 farthings, or 3$\frac{1}{2}$d.

And so on of any other.

PROBLEM.

If the price be given in shillings and pence.

RULE. Multiply the price in pence by 6, double the first figure for shillings for the answer.

Examples.

29. If a dozen silver buttons cost 5s. 9d., what will 1 gross cost?

d.
69
6
£41 8 *Ans.*

30. If a dozen cost 3s. 11d., what will 144 cost?

d.
47
6
£28 4 *Ans.*

31. If a dozen cost 2s. 6d., what will 144 dozen come to?

d.
30
6
£18 0 *Ans.*

32. If a dozen cost 9s. 11d., what is a gross worth?

d.
119
6
£71 8 *Ans.*

PROBLEM.

Having the price per gross, to find the price per dozen.

THIS IS THE RULE. Multiply the price of the gross by five, divide the product by three, the quotient will be the answer in pence.

Examples.

33. If a gross cost 41*l.* 8s., what will a dozen cost?

	£.	s.
	41	8
		5
3÷	207	0
	69	0=5s. 9d. *Ans.*

34. If a gross cost 28*l.* 4s., what will a dozen cost?

	£.	s.
	28	4
		5
3÷	141	0
	47	0=3s. 11d. *Ans.*

PROBLEM.

To find the price per score, the price of an article being given.

RULE. Call the shillings pounds, and then see what proportion the pence bears to the shillings, which you are to add to the shillings also for pounds.

Examples.

35. Twenty pairs of gold ear-rings, at 19s. 9d. per pair. *Ans.* 19*l.* 15s.

REASON. 9d.=$\frac{3}{4}$ of a shilling,—and 15s.=$\frac{3}{4}$ of a pound.

36. Twenty yards of broad cloth, at 11s. 6d. the yard. *Ans.* 11*l.* 10s.
37. Twenty volumes of Burns's poems, at 13s. 9d. a piece. *Ans.* 13*l.* 15s.
38. Twenty pairs of men's shoes, at 7s. 3d. the pair. *Ans.* 7*l.* 5s.
39. Twenty tea-kettles, leaded, at 4s. 9d. each. *Ans.* 4*l.* 15s.
40. Twenty bibles, morocco binding, at 39s. 9d. a piece. *Ans.* 39*l.* 15s.
41. Twenty rose-wood work-boxes, at 17s. 6d. a piece. *Ans.* 17*l.* 10s.
42. Twenty stones of white sugar, at 8s. 9d. per stone. *Ans.* 8*l.* 15s.
43. Twenty legs of mutton, at 13s. 6d. a leg. *Ans.* 13*l.* 10s.
44. Twenty bushels of apples, at 7s. 3d. a bushel. *Ans.* 7*l.* 5s.
45. Twenty sacks of flour, at 2*l.* 7s. 6d. a sack. *Ans.* 47*l.* 10s.
46. Forty table covers, at 12s. 6d. each. *Ans.* 25*l.*

47. Sixty mahogany chairs, stuffed, at 1*l.* 2s. 9d. a piece.
Ans. 68*l.* 5s.

48. Eighty counterpanes, cotton knap. at 12s. 2d a piece.
Ans. 48*l.* 13s. 4d.

49. One hundred silver teaspoons, at 11s. 4d. each.
Ans. 56*l.* 13s. 4d.

50. One hundred and twenty bouquets of flowers, at 8s. 3d. each. *Ans.* 49*l.* 10s.

51. Twenty-five silk vests, at 1*l.* 2s. 9d a piece. *Ans.* 28*l* 8s. 9d.

52. Thirty pairs of trousers, at 16s. 3d. a pair. *Ans.* 24*l.* 7s. 6d.

53. Thirty-five pairs of short boots, at 11s. 3d. a pair.
Ans. 19*l.* 13s. 9d.

54. Forty-five bonnets, at 1*l.* 6s. 8d. a piece. *Ans.* 60*l.*

55. One hundred and forty flower stands, at 13s. 8d. each.
Ans. 95. 13s. 4d.

56. Fifty-five pairs of silk stockings, at 12s. 7d. a pair.
Ans. 34*l.* 12s. 1d.

57. One hundred and sixty sets of chess-men, at 9s. 3d. per set.
Ans. 74*l.*

58. Sixty-five yards of white silk, at 17s. 9d. per yard.
Ans. 57*l.* 13s. 9d.

59. Seventy work baskets, at 3s. 6d. each. *Ans.* 12*l.* 5s.

60. One hundred and eighty pairs of plated candlesticks, at 10s. 3d. a pair. *Ans.* 92*l.* 5s.

61. Seventy-five britannia teapots, at 7s. 2d. each.
Ans. 26*l.* 17s. 6d.

62. One hundred and forty French silk knaps, at 1*l.* 5s. 6d. each. *Ans.* 178*l.* 10s.

63. Ninety gold rings, at 13s. 4d. each. *Ans.* 60*l.*

64. Two hundred yards of cambric lawn, at 1*l.* 4s. 5d. per yard.
Ans. 244*l.* 3s. 4d.

65. * Two hundred and twenty acres of land, at 1*l.* 7s. 6d. an acre, what is the yearly rent ? *Ans.* 302*l.* 10s.

66. Thirty pounds, at 4s. per lb. *Ans.* 6*l.*

67. Fifty pounds, at 5s. 6d. per lb. *Ans.* 13*l.* 15s.

68. Forty pounds, at 6s. 3d. per lb. *Ans.* 12*l.* 10s.

69. Sixty pounds, at 2s. 3d. per lb. *Ans.* 6*l.* 15s.

70. Eighty pounds, at 4s. 6d. per lb. *Ans.* 18*l.*

71. One hundred pounds, at 5s. 3d. per lb. *Ans.* 26*l.* 5s.

72. Two hundred pounds, at 6s. per lb. *Ans.* 60*l.*

73. Two hundred pounds, at 5s. 6d. per lb. *Ans.* 55*l.*

74. Four hundred pounds, at 7s. 3d. per lb. *Ans.* 145*l.*

75. Six hundred pounds, at 9s. 9d. per lb. *Ans.* 292*l.* 10s.

* Find for 20, and double the sum for the answer, and so on with the others in proportion as often as you have 20 contained in the question.

76. Eight hundred pounds, at 12s. per lb. *Ans.* 480*l.*
77. One thousand pounds, at 2s. 3d. per lb. *Ans.* 112*l.* 10s.

Problem.

To find the value of one hundred articles, the price of one being given.

This is the Rule. For every farthing in the price, take as many pence, and twice as many shillings. Thus, 100 pencils, at $1\frac{1}{4}$d. each, is 12s. 6d.—six being the number of farthings.

Reason. Because, by taking a penny for every farthing, is the same as multiplying by four, and taking two shillings for every farthing, is the same as multiplying by ninety-six, and 96+4=100.

Examples.

78. One hundred oranges at $2\frac{1}{2}$d. each. *Ans.* 1*l.* 0s. 10d.
79. One hundred copy-books, at $4\frac{1}{2}$d. each. *Ans.* 1*l.* 17s. 6d.
80. One hundred yards of toweling, at $5\frac{1}{4}$d. per yard. *Ans.* 2*l.* 3s. 9d.
81. One hundred battens, at 1s. $7\frac{1}{2}$d a piece. *Ans.* 8*l.* 0s. 5d.
82. One hundred quarts of vinegar, at 15s. $3\frac{3}{4}$d. a quart. *Ans.* 6*l.* 11s. 3d.
83. One hundred hearth brushes, at 2s. $3\frac{1}{4}$d. a piece. *Ans.* 11*l.* 7s. 1d.
84. One hundred cakes of Windsor soap, at $9\frac{3}{4}$d. a cake. *Ans.* 4*l.* 1s. 3d.
85. One hundred yards of mason work, at $5\frac{3}{4}$d. a yard. *Ans.* 2*l.* 7s. 11d.
86. One hundred perches of sewering, at 3s. $7\frac{1}{2}$d. per perch. *Ans.* 18*l.* 2s. 6d.
87. One hundred cloth caps, at $19\frac{1}{4}$d. each. *Ans.* 8*l.* 0s. 5d.
88. One hundred sticks of sealing wax, at $7\frac{1}{4}$d. a stick. *Ans.* 3*l.* 0s. 5d.
89. One hundred china basons, at $17\frac{3}{4}$d. a piece. *Ans.* 7*l.* 7s. 11d.
90. One hundred guard chains, at 7s. $6\frac{1}{4}$d. a piece. *Ans.* 37*l.* 12s. 1d.
91. One hundred yards of silk twist, at 3s. $11\frac{1}{4}$d. per yard. *Ans.* 19*l.* 13s. 9d.
92. One hundred gold watch chains, at 17s. $10\frac{1}{4}$d. each. *Ans.* 89*l.* 5s. 5d.
93. One hundred yards of silk binding, at $14\frac{1}{2}$d. a yard. *Ans.* 6*l.* 0s. 10d.

94. One hundred gross of steel pens, at 13s. $9\frac{3}{4}$d. the gross.
Ans. 69*l.* 1s. 3d.

PROBLEM.

By knowing the amount of one hundred, to find the price of one.

RULE. To eight times the price add one-fifth of itself, and the sum is the answer in farthings.

Examples.

95. If 100 articles cost 2*l.* 18s. 4d., what is one worth?

£	s.	d.	
2	18	4	
		8	
5)23	6	8	
4	13	4	
Ans. £28	0	0	=28 farthings, or 7d.

96. If 100 yards cost 5*l.* 16s. 8d, what will one cost?

£	s.	d.	
5	16	8	
		8	
5)46	13	4	
9	6	8	
Ans. £56	0	0	=56 farthings, or 14d.

97. If 100 geese cost 11*l.* 13s. 4d., what is that a piece?

£	s.	d.	
11	13	4	
		8	
5)93	6	8	
18	13	4	
Ans. £112	0	0	=112 farthings, or 2s. 4d.

98. If 100 lb. of tea cost 27*l.* 10s., what will one cost?

£	s.	d.	
27	10	0	
		8	
5)220	0	0	
44	0	0	
Ans. £264	0	0	=264 farthings, or 5s. 6d.

CHAPTER XIII.

New Table of 240, *with its component parts.*

For	take		times	
340	1	five-twelfth		240
350	1	eleven-twenty-4th		240
360	1	one-half		240
370	1	thirteen-twenty-4th		240
380	1	seven-twelfth		240
390	1	five-eighth		240
400	1	two-third		240
410	1	seventeen-twenty-4th		240
420	1	one-third		240
430	1	nineteen-twenty-4th		240
440	1	five-sixth		240
450	1	seven-eighth		240
460	1	eleven-twelfth		240
470	1	twenty-three-fortieth		240
480	2			240
490	2	one-twenty-fourth		240
500	2	one-twelfth		240
510	2	one-eighth		240
520	2	one-sixth		240
530	2	five-twenty-fourth		240
540	2	one-fourth		240
550	2	seven-twenty-fourth		240
560	2	one-third		240
570	2	three-eighth		240
580	2	five-twelfth		240
590	2	eleven-twenty-fourth		240
600	2	one-half		240
610	2	thirteen-twenty-4th		240
620	2	seven-twelfth		240
630	2	five-eighth		240
640	2	two-third		240
650	2	seventeen-twenty-4th		240
660	2	three-fourth		240
670	2	nineteen-twenty-4th		240
680	2	fixe-sixth		240
690	2	seven-eighth		240
700	2	eleven-twelfth		240
710	2	twenty-3-twenty-4		240
720	3			240
730	3	one-twenty-fourth		240
740	3	one-twelfth		240
750	3	one-eighth		240
760	3	one-sixth		240
770	3	five-twenty-fourth		240
780	3	one-fourth		240
790	3	seven-twenty-fourth		240
800	3	one-third		240
810	3	three-eighth		240
820	3	five-twelfth		240
830	3	eleven-twenty-fourth		240
840	3	one-half		240
850	3	thirteen-twenty-fourth		240
860	3	seven-twelfth		240
870	3	five-eighth		240
880	3	two-third		240
890	3	seventeen-twenty-4th		240
900	3	three-fourth		240
910	3	nineteen-twenty-4th		240
920	3	five-sixth		240
930	3	seven-eighth		240
940	3	eleven-twenty-fourth		240
950	3	twenty-3-twenty-4th		240
960	4			240
1000	4	one-sixth		240
1200	5			240
1440	6			240
1680	7			240
1920	8			240
2160	9			240
2400	10			240
2640	11			240
2880	12			240

The above table will be found of great utility to the young student, and may be carried on to infinity. The pupil is recommended to get it off by rote, as its object is to facilitate the progress of those who wish to become quick and expert calculators. The ingenious boy will see that the intermediate numbers between the tens can be found at once; so that the system is general, and will be found to answer any number proposed. Let the learner also understand that this case obviates the old Rule-of-Three system, a hateful remembrance to those who have spent years over it, and a terror to the tyro who has the dreary path before him.

Problem.

By having the price of one, to calculate the amount of two hundred and forty, of the same kind.

This is the Rule. Call the pence wich the unit costs pounds, and 'tis done; but observe, if a half-penny, farthing, or three-farthings occur, or be affixed to the pence, call the half-penny ten shillings, and count five shillings for each farthing.

Reason. When a pound costs a penny, 240 lbs. will cost a pound. Hence, in general, as many pence as the pound costs, as many pounds will be the cost of 240 lbs.; and you are to consider likewise, when 1 lb. costs a half-penny, 240 lbs. will cost ten shillings, and if a pound costs a farthing 240 lbs. will cost five shillings, Therefore, the Rule is correct, to call the pence pounds, the half-penny ten shillings, and five shillings for each farthing.

Examples.

1. 240 lb., at 10d. per lb. *Ans.* 10*l.* 0s. 0d.
2. 240 stones at 17½ d. per stone. *Ans.* 17*l.* 10s. 0d.
3. 240 yards, at 19¼d. per yard. *Ans.* 19*l.* 5s. 0d.
4. 240 hats, at 6s. 6d. per hat. *Ans.* 78*l.* 0s. 0d.
5. 240 reams of paper, at 4s. 9d. per ream. *Ans.* 57*l.* 0s. 0d.
6. 240 lambs at 7s. 7¾d. per lamb. *Ans.* 91*l.* 15s. 0d.
7. 240 yards of ribbon, at 1s. 1¾d. per yard. *Ans.* 13*l.* 15s. 0d.
8. 240 stones of flour, at 2s. 2¼d. per stone. *Ans.* 26*l.* 5s. 0d.
9. 240 lb. of tea, at 5s. 9¾d. per lb. *Ans.* 69*l.* 15s. 0d.
10. 240 stones of beef, at 5s. 11¼d. per stone. *Ans.* 71*l.* 15s.
11. 240 lb. of indigo, at 8s. 7½d, per lb. *Ans.* 103*l.* 10s.
12. 240 wedding rings, at 17s. 9¾d. a piece. *Ans.* 213*l.* 15s.
13. 240 cwt. of Cheshire cheese, at 2*l.* 19s. 9¼d. a cwt. *Ans.* 717*l.* 5s.
14. 240 ounces of cochineal, at 11s. 9½d. per ounce. *Ans.* 141*l.* 10s.
15. 240 silver forks, 15s. 11¼d. per fork. *Ans.* 191*l.* 15s.
16. 240 chased silver salvers, 23s. 7¼d. a piece. *Ans.* 283*l.* 5s.
17. 240 fine gold watch chains, at 70s. 5¼d. a piece. *Ans.* 845*l.* 15s.
18. 240 quarters of oats, at 54s. 9¼d. per quarter. *Ans.* 657*l.* 5s.
19. 240 firkins of butter, at 56s. 2¾d. per firkin. *Ans.* 674. 15s.
21. 240 flitches of bacon, at 33s. 10½d. per flitch. *Ans.* 406*l.* 5s.
22. 240 cwt. of iron, at 15s. 11¼d. per cwt. *Ans.* 191*l.* 5s.
23. 240 tons of logwood, at 150s. the ton. *Ans.* 1800*l.*
24. 240 tons of red sanders wood, at 180s. per ton. *Ans.* 2160*l.*

25. 240 tons of camwood, at 15*l.* per ton. *Ans.* 3600*l.*
26. 240 roofing tiles, at 1s. 9¾d. a piece. *Ans.* 21*l.* 15s.
27. 240 ton of slates, at 3s. 7½d. a piece. *Ans.* 43*l.* 10s.
28. 240 stone of jars, at 2s. 1½d. a piece. *Ans.* 25*l.* 10s.
29. 240 pounds of dressed leather, at 2s. 3¼d. a pound. *Ans.* 27*l.* 5s.
30. 240 pairs of tweezers, at 1s. 11¼d. a pair. *Ans.* 23*l.* 5s.
31. 240 sacks of potatoes, at 6s. 5½d. each. *Ans.* 77*l.* 10s.
32. 240 gallons of brandy, at 16s. 9d. a gallon. *Ans.* 201*l.*
33. 240 loads of hay, at 3*l.* 10s. per load. *Ans.* 840*l.*
34. 240 ton of iron, at 13*l.* 10s. a ton. *Ans.* 3240*l.*
35. 240 yards of lawn, at 17s. 9¼d. a yard. *Ans.* 213*l.* 5s.
36. 240 reams of foolscap, at 9s. 8¼d. a ream. *Ans.* 116*l.* 5s.
37. 240 yards of cambric, at 1*l.* 7s. 9d. a yard. *Ans.* 333*l.*
38. 240 yards of Brussels carpeting, at 7s. 11d. a yard. *Ans.* 95*l.*
39. 240 pounds of fine silk, at 16s. 9d. the lb. *Ans.* 201*l.* 0s.
40. 240 dozen of Flanders lace, at 3s. 8¾d. *Ans.* 44*l.* 15s.
41. 240 cwt. of Cheshire cheese, at 2*l.* 12s. 6d. per cwt. *Ans.* 630*l.*
42. 240 yards of Yorkshire broad cloth, at 16s. 7¾d. per yard. *Ans.* 199*l.* 15s.

Problem.

To calculate the amount of any number that contains two hundred and forty, without a remainder.

This is the Rule. Call the pence which the integer costs pounds, and if a half-penny, farthing, or three-farthings occur, or be affixed to the pence as before, call the half-penny ten shillings, and reckon a crown for each farthing, which multiply by the number of times the given number contains two hundred and forty, the result will be the amount.

What is the amount of each of the following commodities, at their respective prices per integer?

Examples.

43. What is 480 stones of wheat worth, at 17¾d. per stone?

£.	s.
17	15
	2
£35	10 *Ans.*

44. What is 720 stones of oats worth, at 7½d. per stone? *Ans.* 21*l.* 15s.

45. What is 960 stones of barley worth, at 10½d. per stone?
Ans. 42*l.*

46. What is 1200 lb. of beef worth, at 4¼d. per lb.
Ans. 21*l.* 5*s.*

47. What is 1440 lb. of tobacco worth, at 3*s.* 9d. per lb.?
Ans. 270*l.*

48. What is 1680 lb. of snuff worth, at 5*s.* 5¾d. per lb.?
Ans. 458*l.* 10*s.*

49. What is 1920 lb. of mutton worth, at 7d. per lb.?
Ans. 56*l.*

50. What is 2160 yards of cord worth, at 18¾d. per yard?
Ans. 168*l.* 15*s.*

51. What is 2400 yards of linen worth, at 15¼d. per yard?
Ans. 152*l.* 10*s.*

PROBLEM.

To calculate the amount of any number greater than 240, *but prime to it, that is, any number that* 240 *does not measure, without a remainder.*

THIS IS THE RULE. Call the pence, &c., which the integer costs, pounds, which multiply by the number of times that 240 is contained in the given number, to which add the value of the prime part, and the sum will be the amount of the given number.

Examples.

52. What is the amount of 247 stones of wheat, at 15¾d. per stone?

£	s.	d.		s.	d.	
15	15	0		1	3¾	
0	9	2¼			7	
£16	4	2¼	*Ans.*	9	2¼	The price of 7 stones.

53. Nine hundred and sixty-seven pounds of rice, at 4¼d. per lb.
Ans. 17*l.* 2*s.* 5¾d.

54. One thousand two hundred and nine pounds of sugar, at 6½d. per lb. *Ans.* 32*l.* 14*s.* 10½d.

55. One thousand one hundred and ninety-nine and three-quarter pounds of tea, at 5*s.* 5½d. per lb. *Ans.* 327*l.* 8*s.* 7⅝d.

56. Seven hundred and nineteen and a half pounds of honey, at 3¾d. per lb. *Ans.* 11*l.* 4*s.* 10⅛d.

Problem.

To calculate the amount of any aliquot part of 240, *at any proposed price per integer.*

This is the Rule. Call the pence, pounds, of which take the said aliquot part, for the amount of the proposed part.

Examples.

57. What is the value of 20 stones of wheat, at $17\frac{1}{4}$d. per stone?

	£	s.	d.
	17	5	0
One-twelfth	£1	8	9 *Ans.*

58. 30 stones of wheat, at 18d. per stone *Ans.* 2*l.* 5s.
59. 40 stones of oats, at $15\frac{1}{5}$d. per stone. *Ans.* 2*l.* 11s. 8d.
60. 48 stones of bran, at 10d. per stone. *Ans.* 2*l.*
61. 60 stones of flax, at 3s. $7\frac{1}{2}$d. per stone. *Ans.* 10*l.* 17s. 6d.
62. 80 stones of wool, at 11s. $11\frac{1}{4}$d. per stone. *Ans* 47*l.* 15s.
63. 120 lambs, at 7s. $7\frac{1}{4}$d. per lamb. *Ans.* 45*l.* 17s. 6d.

Problem.

To compute the value of any number less than 240, *such that the deficiency may be an aliquot part of* 240.

This is the Rule. Of the price of the integer written as pounds, take said part; then the excess of the cost of 240 above the cost of the part, will be the cost of the proposed number.

Examples.

64. What is the value of 160 stones of wheat, at 15d. per stone?

	15	The cost of 240,
One-third	5	The cost of 80 the deficiency.
	£10	Value of the proposed number.

65. 180 lb. of beef, at $4\frac{1}{5}$d. per lb. *Ans.* 3*l.* 7s. 6d.
66. 200 lb. of iron, at $2\frac{1}{4}$d. per lb. *Ans.* 1*l.* 17s. 6d.
67. 220 lb. of sugar, at $6\frac{1}{2}$d. per lb. *Ans.* 5*l.* 19s. 2d.
68. 210 lb. of coffee, at 1s. 8d. per lb. *Ans.* 17*l.* 10d.

Problem.

To calculate the amount of any number greater than 240, *such that the excess may be an aliquot part of* 240.

This is the Rule. Write the pence as pounds, to which add such a part of the same as the excess is of 240, the sum will be the amount.

Examples.

69. What is the value of 260 lb. of madder, at 2s. 7½d. per lb.?

	£	s.	d.	
	31	10	0	the price of 240.
One-twelfth	2	12	6	the price of 20.
	£34	2	6	*Ans.*

70. What is 270 lb. worth, at 13½d. per lb.? *Ans.* 15*l.* 3s. 9d.
71. What is 280 lb. worth, at 9¼d. per lb.? *Ans.* 10*l.* 15s. 10d.
72. What is 300 lb. worth, at 11¼d. per lb.? *Ans.* 14*l.* 1s. 3d.
73. What is 320 lb. worth, at 8¾d. per lb.? *Ans.* 11*l.* 13s. 4d.
74. What is 360 lb. worth, at 15¾d. per lb.? *Ans.* 23*l.* 12s. 6d.

Another Example.

75. What is the price of 400 lb. of cheese, at 1¾d. per lb.?

£	s.	d.	
1	15	0	price of 240.
3	10	0	price of 480.
0	11	8	price of 80 off.
£2	18	4	price of 400.

76. What is 420 stones worth, at 15½d. per stone?
Ans. 27*l.* 2s. 6d.
77. What is 440 stones worth, at 9¼d. per stone?
Ans. 16*l.* 19s. 2d.
78. What is 460 stones worth, at 11½d. per stone?
Ans. 22*l.* 0s. 10d.
79. What is 480 stones worth, at 10¼d. per stone?
Ans. 20*l.* 10s. 0d.

Another Example.

80. What is 500 stones of oats worth, at 10¾d. per stone?

£	s.	d.	
10	15	0	
		2	
21	10	0	price of 480.
0	17	11	price of 20.
Ans. £22	7	11	price of 500.

81. What is 520 stones worth, at 6½d. per stone?
Ans. 14*l.* 1s. 8d.
82. What is 540 stones worth, at 17d. per stone? Ans. 38*l.* 5s.

83. What is 560 lb. worth, at 11½d. per lb.? *Ans.* 26*l.* 5s.
84. What is 600 lb. worth, at 18¾d. per lb.? *Ans.* 46*l.* 17s. 6d.

Another Example.

85. What is 640 lb. of soap worth, at 7¼d. per lb.?

£	s.	d.	
7	5	0	price of 240.
		3	
21	15	0	
2	8	4	price of 80 off.
£19	6	8	*Ans.*

86. What is 600 lb. of loaf sugar worth, at 10½d. per lb.?
Ans. 28*l.* 17s. 6d.
87. What is 680 lb. of raisins worth, at 9½d. per lb.?
Ans. 26*l.* 4s. 2d.
88. What is 700 lb. of coffee worth, at 3s. 9½d. per lb.?
Ans. 132*l.* 14s. 2d.
89. What is 720 lb. of ginger worth, at 5½d. per lb.?
Ans. 16*l.* 10s.

Further Illustration.

90. What is 740 lb. worth, at 41d. per lb.?

£	s.	d	
41	0	0	price of 20.
		3	
123	0	0	price of 720.
3	8	4	price of 20.
£126	8	4	*Ans.*

91. What is 760 lb. worth, at 18½d. per lb.? *Ans.* 58*l.* 11s. 8d.
92. What is 780 lb. worth, at 17d. per lb.? *Ans.* 55*l.* 5s.
93. What is 800 lb. worth, at 19d. per lb.? *Ans.* 63*l.* 6s. 8d.

It is evident, from what has been laid before the reader, that this mode of calculation may be carried as far as you please; and, it is equally evident, how any odd number, bordering on these may be computed,—for, it is only required to find the amount of the even part, as is already shewn, to which add the value of the prime part, the total will be the amount required.

There is another beautiful method, usually practised in the counting-house, which is general when the price per integer is low:—

It is simply this. Find the amount of the quantity whose value is required at a penny, which multiply by the number of pence

charged per integer; the result will be the amount. An example will make this sufficiently explanatory.

Examples.

94. What is 177 yards of cloth worth, at 7d. per yard?

	£	s.	d.
177 yds. at 1d.	0	14	9
			7
	£5	3	3 *Ans.*

95. What is the value of 78¾ yards, at 15d. per yard?

	£	s.	d.
	3	18	9
One-fourth	0	19	8¼
	£4	18	5¼ *Ans.*

Explanation.

78¾ yards, at 1s. each, will be 78¾ shillings, or 3*l.* 18s. 9d., to which add its one-fourth for the amount required.

96. What is the value of 240 lb. of green tea, at 1*l.* 7s. 7½d. per lb.?

lb.		£	s.	d.	£	s.
240	at	1	0	0	=240	0
240	at	0	7	0	= 84	0
240	at	0	0	7	= 7	0
240	at	0	0	0½	= 0	10
					£331	10 *Ans.*

Explanation.

240 lb. at one pound, will be two hundred and forty pounds; 240 lb., at seven shillings per lb., will be eighty-four pounds; 240 lb., at seven-pence per lb., will be seven pounds; and 240 lb. at one half-penny per lb., will amount to ten shillings, making in all, three hundred and thirty-one pounds ten shillings, as required.

To impress this more imperatively on the mind, let the following questions be solved by the same peculiar artifice.

97. 720 sheep, at 2*l.* 13s. 7d. per sheep? *Ans.* 1930*l.* 10s.
98. 480 yards of cloth, at 1*l.* 13s. 7½d. per yard? *Ans.* 807*l.* 0s.
99. 360 lb. of gold, at 3*l.* 8s. 4½d. per lb.? *Ans.* 1230*l.* 15s.
100. 960 cwt. of sugar, at 2*l.* 11s. 4d. per cwt.? *Ans.* 2464*l.*
101. 1200 lambs, at 11s. 7d. per lamb? *Ans.* 695*l.*

NOTE. You are to observe, if the number proposed be odd, as (487), first find the amount of the even part as above, to which add the value of seven: the sum will be the answer.

PROBLEM.

To compute the value of any commodity expressed in whole numbers, at an integral number of shillings, per integer.

THIS IS THE RULE. Multiply the proposed number by half the price when even, or by half the greatest even number contained therein; when odd, double the units' figure of the product for shillings, the remainder will be pounds; but for the odd part, add mentally its amount, at a shilling per integer. Thus, at 13s. per yard, what is the value of 83 yards?

	83 yds.		
	6		
	49	16	at 12s.
83s. are	4	3	
	£53	19	*Ans.*

REASON. There are six twos contained in the greatest even number in 13, and when 83 is multiplied by six, it produces 498 twos, the tenth of which will be pounds; but its tenth is the whole product to the units' figure, which figure, multiplied by two, produces shillings, which is the same in effect as multiplying it by 20, and dividing the result by 10.

PROBLEM.

When the price per integer is close to a pound, call the quantity whose value is required pounds, and add or subtract the difference as it occurs, more or less.

Examples.

102. What is the cost of 176¾ lb. of green tea, at 15s. per lb.?

	£	s.	d.	
Call 176¾ lb. £176¾ or	176	15	0	
One-fourth	44	3	9	
	£132	11	3	*Ans.*

CASE 2.

TO CALCULATE FOR WOOL.

By knowing the price per pound, to know the price per stone.

THIS IS THE RULE. Call the pence, &c., which the pounds costs, shillings, to which add one-fourth thereof, and the sum will be the amount per stone.

REASON. When you call the pence shillings, you have the value of 12 lb., and when you take one-fourth thereof, you have the value of 3 lb., the total of both will be the value of 15 lb, or a stone.

Examples.

103. What is the value of a stone of wool, at 15¾d. per lb.?

	s.	d.	
	15	9	per rule.
Add one-fourth thereof	3	11¼	
	s.19	8¼	*Ans.*

NOTE. In Ireland the stone of wool is 16 lb.; to calculate for, this is the rule. The one-third of the farthings, which a pound costs, will be the price of the stone in shillings.

104. At 21s. per stone, of 16 lb., what is that per lb.?

RULE. Three times the price of the stone in shillings, will be the price of the pound in farthings.

REASON. If one shilling be the cost per stone, when a pound costs three-farthings, what will it be per pound at any proposed price per stone. Hence, from the analogy, this rule is correct.

21s.
3

Ans. 63 farthings, or 15¾d. per lb.

PROBLEM.

To compute the value of any number of stones or pounds, at any proposed price per stone.

THIS IS THE RULE. Call the stones pounds, and to the pounds add one-fourth of the same for shillings, and the result will be the amount at a pound sterling per stone; but if the price be not a pound, take such proportional parts of the amount as the given difference is of a pound, which, if more, add, and if less, subtract for the amount.

The calculation of feathers, bran, or barley, is the same, because each of these standards contain as many integers of its own denomination as a stone of wool contains pounds; and the reason of the rule is this,—when you estimate a stone at a pound, will be worth 1s. 3d.

CASE 3.

THE CALCULATION OF WHEAT.

By knowing the price per stone, to know the price per barrel.

THIS IS THE RULE. Call the pence which the stone costs, pounds, and its one-twelfth will be the amount per barrel; or five

times the price of the stone in pence, will be the price of the barrel in groats; or when the price per stone is integral, affix a cypher thereto, the one-sixth of which will be the price per barrel in shillings.

REASON. When you write the pence as pounds, you have the amount of 240, the one-twelfth of which, will be the value of 20. Secondly.—When a stone costs a penny, 20 stone will cost five groats; then say if one penny be the cost per stone, when five groats is the cost per barrel, what will be the cost price per barrel in groats, at any proposed price per stone. Hence, the rule is manifest. Thirdly.—When a stone costs sixpence, a barrel will cost ten shillings; then say, if at sixpence per stone, a barrel costs ten shillings, what will be the amount per barrel at any proposed price per stone. Hence, the operation of this analogy, expressed in words, forms the rules.

105. At 15½d. per stone of wheat, what is that per barrel?

Example.

	£	s.	d.
	15	10	0
One-twelfth	£1	5	10

PROBLEM.

By having the amount per barrel, to know the amount per stone.

THIS IS THE RULE. Multiply the price of the barrel in shillings by three, and divide the product by five, the quotient will be the price of the stone in pence.

Example.

106. At 35s. per barrel, what is that per stone?

s.
35
3
5÷105

Ans. 21d. per stone

REASON. If five shillings be the amount per barrel, at threepence per stone, what is the value of a stone, at thirty-five shillings per barrel. Hence, the work of the operation is literally the rule.

PROBLEM.

To calculate the amount of any number of barrels, stones, and pounds, at any proposed price per barrel or stone.

THIS IS SHE RULE. Call the barrels pounds, the stones shillings, and the six-seventh of the pounds pence, and it will be the

amount, at one pound per barrel; and, if the price be more, add, if less, subtract proportionably of a pound.

Example.

107. What is the amount of 12 barrels, 13 stones, 7 lb., at 1*l.* 10s. per barrel.

	£	s.	d.	
	12	13	6	the amount at a pound per rule.
One-half	6	6	9	the amount at 10s.
	£19	0	3	*Ans.*

CASE 4.

THE CALCULATION OF OATS.

By having the price of a stone, to know the amount per barrel.

THIS IS THE RULE. Call the pence which the stone costs shillings, and if a half-penny, farthing, or three-farthings occur, call the halfpenny six-pence, and write three-pence for each farthing, to which add its one-sixth for the price of a barrel.

REASON. When you write the price of a stone in pence as shillings, you have the value of 12 stones; and when you add its one-sixth thereto, you have the value of 14 stones—the small barrel of oats.

Example.

108. At 14¾d. per stone, what is it per barrel?

	s.	d.	
	14	9	
One-sixth	2	5½	
	17	2¼	*Ans.*

PROBLEM.

To calculate the amount of any number of barrels, stones, and pounds, at any proposed price per barrel.

THIS IS THE RULE. Allow fourteen shillings per barrel, one shilling per stone, and six-seventh of a penny per pound; then if the price be more, add, if less, subtract proportionably.

Example.

109. At 10s. 6d. per barrel, what is the amount of 10 barrels, 12 stones, 7 lb?

	brls.	st.	lb.	
	10	12	7	
	14	1	6	seventh of 7s. 6d.
	7	12	6	
3s. 6d. are one fourth	1	18	$1\frac{1}{2}$	
	£5	14	$4\frac{1}{2}$	*Ans.*

PROBLEM.

By having the price of a barrel of oats, to know the amount per stone.

THIS IS THE RULE. From the price of the barrel in shillings, deduct its one-seventh, the remainder will be the price of the stone in pence; or the one-seventh of six times the price of the barrel in shillings, will be the price of the stone in pence.

Example.

110. At 14s. per barrel, what is that per stone?

	s.
	14
One-seventh	2
Ans.	12 pence per stone.

CASE 5.

THE CALCULATION OF LAND.

PROBLEM.

By having the price of a perch, to know the amount per acre.

THIS IS THE RULE. Write the price of a perch in pence as pounds, and from it deduct its one-third, the remainder will be the amount of the acre in pounds; or, multiply the price of the perch in pence by two, and divide the product by three, the quotient will be the amount per acre in pounds.

Example.

111. At $15\frac{3}{4}$d. per perch, what is that per acre?

	15	15	the amount of 240.
One-third off	5	5	
Ans.	£10	10	the amount of 160 perches.

PROBLEM.

By having the price per perch, to know the amount per rood.

THIS IS THE RULE. Call the pence which the perch costs, pounds, and the one-sixth thereof will be the amount per rood.

Example.

112. At 6d. per perch, what is that per rood?

£6 the amount of 240.

One-sixth £1 the amount of 40 perches or a rood.

PROBLEM.

To calculate the amount of any number of acres, roods, and perches.

THIS IS THE RULE. Call the acres pounds, five times the roods shillings, and three times the perches half-pence, which will be the amount at one pound per acre; then, if the price per acre be more, add, if less, subtract proportionably of a pound.

Example.

113. What is the rent per annum of 35 acres, 3 roods, 20 perches, at 1*l.* 5s. per acre?

	£.	s.	d.	
	35	17	6	at a pound mentally per rule.
One-fourth	8	19	4½	at a crown.
	£44	16	10½	amount required.

REASON. Allow a pound per acre, and estimate the rood, and perch in proportion.

PROBLEM.

By having the price per perch, to know the amount per acre.

THIS IS THE RULE. To the price of the acre in pounds, add its half, and call the pounds of the sum the price of the perch in pence. Or thus.—Multiply the price of the acre in pounds by three, and divide the product by two, the quotient will be the price of the perch in pence.

Example.

114. At 6*l.* per acre, what is that a perch?

	£	
	6	
One-half	3	
	9d.	per perch.

Case 6.

CALCULATION OF AVOIRDUPOIS WEIGHT.

Problem.

By having the price of a dram in pence or farthings, to find the value of any number of pounds.

This is the Rule. Multiply the price of a dram by sixteen, and that product by the number of pounds; double the first figure for shillings, then dvide by six for the answer.

Examples.

115. At 3¼d. the dram, what cost 8 lb?

farthings.
13
16
208
8
6÷1668
£27 14 8 *Ans.*

116. At 4½d. the dram, what cost 68 lb. *Ans.* 326*l.* 8*s.*

Problem.

By having the price of one ounce in farthings, to find the value of a pound.

This is the Rule. Divide the price of an ounce in farthings by three, the quotient will be shillings, and what remains, so many parts of a shilling.

Examples.

117. At 5¼d. the ounce, what is the cost of a pound?

3÷21
7s.

118. At 11¼d. the ounce, what is the cost of a pound? *Ans.* 15*s.*
119. At 9¾d. the ounce, what is the cost of a pound? *Ans.* 12s. 4d.
120. At 7¾d. an ounce, what is a pound worth? *Ans.* 10s. 4d.

Problem.

By having the price of an ounce in farthings, to find the price of 112 *lb.*

This is the Rule. Multiply by the price of one ounce in farthings, double the first figure for shillings, and divide by 6 for the answer.

Example.

121. At $4\frac{1}{4}$d. the ounce, what cost 112 lb. of tea?

	lbs.		
	112		
	17		
6÷	190	8	
	£31	14	8d. *Ans.*

122. At $8\frac{1}{2}$d. the ounce, what cost 224 lb? *Ans.* 126*l.* 18s. 8d.

123. At $7\frac{3}{4}$d. the ounce, what cost 346 lb? *Ans.* 178*l.* 15s. 4d.

PROBLEM.

By having the price of one hundred and twelve pounds, to find the value of an ounce.

THIS IS THE RULE. Multiply the price of one hundred and twelve pounds by five, divide the product by seven, and one-quarter of that sum subtracted from itself is the answer in farthings.

Examples.

124. If 112 lb of tea cost 31*l.* 14s. 8d., what is it an ounce?

	£	s.	d.
	31	14	8
			5
7÷	158	13	4
$\frac{1}{4}$	22	13	4
	5	13	4
Farthings	17	0	0=4$\frac{1}{4}$d. *Ans.*

125. If 1 cwt. of Tobacco cost 36*l.* 6s. 6d., what is that per ounce? *Ans.* $4\frac{1}{4}$d.

126. Bought 112 lb of coffee for 7*l.* 18s. 2d., what was it an ounce? *Ans.* $1\frac{5}{8}\frac{3}{9}\frac{}{6}$d.

PROBLEM.

By having the price of one hundred and twenty pounds, to find the price of an ounce.

THIS IS THE RULE. Divide the price of one hundred and twenty by two, the quotient will be the answer in farthings.

Examples.

127. If 120 lb cost 60*l.*, what will one ounce cost?

	£
2÷	60
Ans.	30 farthings, or $7\frac{1}{2}$d.

128. If 120 lb cost 80*l.*, what is an ounce worth at that rate?

£
2÷80

Ans. 40 farthings, or 10d.

PROBLEM.

By knowing the price of one pound in farthings, to find the price of one hundred and twelve pounds.

THIS IS THE RULE. Write down the farthings which one pound costs, double the unit's figure for shillings, add one-sixth of itself and you have the answer.

Examples.

129. If 1 lb of sugar cost 4½d., what cost 112 lb?

farthings.
18
2
⅙÷1 16
0 6
£2 2 *Ans.*

130. If one pound of loaf sugar cost 9¾d., what cost 1 cwt?

farthings.
39
2
⅓÷3 18
0 13
£4 11 *Ans.*

PROBLEM.

When so many pence per pound.

RULE. Multiply nine shillings and fourpence, by the number of pence which one pound costs, the result will be the amount per cwt.

The foregoing rules should be well studied, and will be found of the greatest utility to the commercial man.

Example.

131. At 7d. per lb., what is that per cwt?

s. d.
9 4
7
£3 5 4 *Ans.*

PROBLEM.

By having the price per pound, to know the amount per quarter.

THIS IS THE RULE. Seven times the price of a pound in pence, will be the price per quarter in groats; or multiply two shillings and fourpence by the price of a pound in pence, for the price of the quarter.

Example.

132. At 4d. per pound, what is that per quarter, or 28 lb?

d.		s.	d.
4	or	2	4
7			4
28 groats, or 112d.=9s. 4d.		9	4

PROBLEM.

To calculate the value of cwts., quarters, and pounds, at any price per pound.

THIS IS THE RULE. Bring the cwts. into pounds, and calculate as before directed.

Examples.

133. 3 cwt. 1 qr. 4 lb of sugar, at 5d. per pound.

cwt.		£	s.	d.
3				
3				
3				
3				
28				
4				
368	which call pence=	1	10	8
				5
		£7	14	4 *Ans.*

134. 5 cwt. 2 qrs. mill board, at 1½d. per pound.

cwt.		£	s.
5			
5			
5			
5			
56			
1½d. ⅛ 616			
77s.=		3	17 *Ans.*

135. 135 cwt. 1qr. 27 lb of tea, at 5s. per pound.

	cwt.
	135
	135
	135
	13528
	27
5s.	4 | 15175
	£3793 15s. *Ans.*

136. 27 cwt. 2 qrs. 18 lb of cast steel, at 3¾d. per pound.
Ans. 48*l.* 8s. 1½d.

137. 27 cwt. 2 qrs. 18 lb of shot, at 3d. per pound.
Ans. 38*l.* 14s. 6d.

138. 105 cwt. 1 qr. 12 lb of iron, at 2d. per pound.
Ans. 98*l.* 6s. 8d.

139. 76 cwt. 3 qrs. 17 lb of tobacco at 2s. 7½d. per pound.
Ans. 1130*l.* 9s. 1½d.

140. 47 cwt. 2 qrs. 10 lb of Wheeler's axe-heads, at 8d. per pound.
Ans. 177*l.* 13s. 4d.

141. 144 cwt. 2 qrs. 19 lb of iron chain, at 2¾d. per pound.
Ans. 185*l.* 13s. 2¼d.

142. 17 cwt. 2 qrs. 11 lb of Dutch cheese, at 3¾d. per pound.
Ans. 30*l.* 15s. 11¼d.

143. 31 cwt. 3 qrs. 27 lb of Cheshire cheese, at 7¾d. per pound.
Ans. 115*l.* 14s. 0¼d.

144. 73 cwt. 1 qr. 21 lb of coffee, at 2s. 1½d. per pound.
Ans 873*l.* 18s. 1½d.

145. 112 cwt. 3 qrs. 17 lb of loaf sugar, at 8¾d per pound.
Ans. 461*l.* 0s. 3¾d.

146. 27 cwt. 1qr. 7 lb of tea, at 4s. 10½d per pound.
Ans. 745*l.* 12s. 7½d.

147. 19 cwt. 3 qrs. 19 lb of raisins, at 5¾d. per pound.
Ans. 53*l.* 9s. 0¼d.

Problem.

To compute the value of any number of cwts., quarters, and pounds, at any proposed price per cwt.

This is the Rule. Call the cwts. pounds, five times the quarters shillings, and two and the one-seventh times the pounds pence, the result will be the amount at a pound; then if the price *per cwt. be more,* add, if less, subtract proportionably of a pound.

Example.

148. What is 13 cwt. 2 qrs. 14 lb of pork, at 1*l.* 6s. 8d. per cwt.

	£	s.	d.	
	13	12	6	per rule, amount at 1*l.* per cwt.
One-third	4	10	10	amount at 6s. 8d.
	£18	3	4	*Ans.*

THE REASON of this rule is well established, to be by estimating the cwt. at a pound, and the quarter and pound, proportionably.

PROBLEM.

To find the value of a pound, the price per ounce being given.

THIS IS THE RULE. If it be a pound avoirdupois, divide the farthings in the price per ounce by three, for the answer in shillings; if it be a pound Troy, divide by four.

REASON. By taking the farthings as shillings, is multiplying by 48; now $48 \div 3 = 16$ oz. in a pound avoirdupois; and $48 \div 4 = 12$ lb. Troy.

149.	1 lb. avoirdupois, at 1¼d. per ounce.	*Ans.* 2s.
150.	1 lb. avoirdupois, at 2d. per ounce.	*Ans.* 2s. 8d.
151.	1 lb. avoirdupois, at 3d. per ounce.	*Ans.* 4s.
152.	1 lb. avoirdupois, at 5d. per ounce.	*Ans.* 6s. 8d.
153.	1 lb. avoirdupois, at 7¼d. per ounce.	*Ans.* 10s.
154.	1 lb. avoirdupois, at 10¾d. per ounce.	*Ans.* 14s. 4d.
155.	1 lb. Troy, at 4d. per ounce.	*Ans.* 4s.
156.	1 lb. Troy, at 2¼d. per ounce.	*Ans.* 2s. 6d.
157.	1 lb. Troy, at 6¾d. per ounce.	*And.* 6s. 9d.
158.	1 lb. Troy, at 7¼d. per ounce.	*Ans.* 7s. 3d.
159.	1 lb. Troy, at 9¾d. per ounce.	*Ans.* 9s. 6d.
160.	1 lb. Troy, at 11¾d. per ounce.	*Ans.* 11s. 9d.

PROBLEM.

To find the value of an ounce, the price per pound being given.

THIS IS THE RULE. If it be an ounce avoirdupois, take the shillings as farthings, and multiply by three; if it be an ounce Troy, multiply by four.

REASON. Because taking the shillings as farthings, is equal to dividing by forty-eight, instead of sixteen; therefore we multiply by three, for $16 \times 3 = 48$; and in the case of Troy weight we multiply by four, for $12 \times 4 = 48$.

161.	1 lb avoirdupois, at 2s. per pound.	*Ans.* 1¼d.
162.	1 lb avoirdupois, at 1s. per pound.	*Ans.* 0¾d.
163.	1 lb avoirdupois, at 3s. per pound.	*Ans.* 2¼d.
164.	1 lb avoirdupois, at 6s. per pound.	*Ans.* 4½d.
165.	1 lb avoirdupois, at 9s. per pound.	*Ans.* 6¾d.
166.	1 lb avoirdupois, at 10s. per pound.	*Ans.* 7½d.

167. 1 oz. Troy, at 2s. per pound. *Ans.* 2d.
168. 1 oz. Troy, at 1s. per pound. *Ans.* 1d.
169. 1 oz. Troy, at 3s. per pound. *Ans.* 3d.
170. 1 oz. Troy, at 6s. per pound. *Ans.* 6d.
171. 1 oz. Troy, at 9s. per pound. *Ans.* 9d.
172. 1 oz. Troy, at 10s. per pound. *Ans.* 10d.

PROBLEM.

To find the value of a cwt., or one hundred and twelve pound the price per pound being given.

THIS IS THE RULE. Take nine times as many shillings, and four times as many pence, as there are pence in the price per pound.

THE REASON. Because, 9s. 4d.=112d.

173. 1 cwt., at 2d. per pound. *Ans.* 18s. 8d.
174. 1 cwt., at 3d. per pound. *Ans.* 28s.
175. 1 cwt., at 6d. per pound. *Ans.* 56s.
176. 1 cwt., at 4d. per pound. *Ans.* 37s. 4d.
177. 1 cwt., at 5d. per pound. *Ans.* 46s. 8d.
178. 1 cwt., at 1d. per pound. *Ans.* 9s. 4d.
179. 1 cwt., at 7d. per pound. *Ans.* 65s. 4d.
180. 1 cwt., at 8d. per pound. *Ans.* 74s. 8d.
181. 1 cwt., at 9d. per pound. *Ans.* 84s.
182. 1 cwt., at 10d. per pound. *Ans.* 93s. 4d.
183. 1 cwt., at 11d. per pound. *Ans.* 102s. 8d.
184. 1 cwt., at 12d. per pound. *Ans.* 112s.

PROBLEM.

To find the value of a pound, the price per cwt. being given.

THIS IS THE RULE. Multiply the shillings in the price by three, and divide by seven, for the price of a pound in farthings, and it is done.

REASON.—Because, taking the shillings as farthings, is the same as dividing by forty-eight, and dividing by forty-eight and by seven, and multiplying by three, is the same as dividing by one-hundred and twelve.

185. 1 lb at 0*l.* 7s. per cwt. *Ans.* $0\frac{3}{4}$d.
186. 1 lb at 0*l.* 9s. per cwt. *Ans.* $0\frac{6}{7}$d.
187. 1 lb at 0*l.* 11s. per cwt. *Ans.* $1\frac{5}{28}$d.
188. 1 lb at 1*l.* 5s. per cwt. *Ans.* $2\frac{19}{28}$d.
189. 1 lb at 2*l.* 6s. per cwt. *Ans.* $4\frac{3}{4}$d.
190. 1 lb at 3*l.* 0s. per cwt. *Ans.* $6\frac{3}{7}$d.
191. 1 lb at 3*l.* 10s. per cwt. *Ans.* $7\frac{1}{2}$d.
192. 1 lb at 4*l.* 9s. per cwt. *Ans.* $9\frac{15}{28}$d.
193. 1 lb at 5*l.* 15s. per cwt. *Ans.* $12\frac{9}{28}$d.
194. 1 lb at 10l. 8s. per cwt. *Ans.* $22\frac{2}{7}$d.

PROBLEM.

To find the value of a ton, the price per pound being given.

THIS IS THE RULE. Find the value of a cwt., and take the shillings in the price of a cwt. as pounds. For every fourpence add six and eightpence.

195.	1 ton, at 1d. per pound.	*Ans.* 9*l.* 6*s.* 8d.
196.	1 ton, at 3d. per pound.	*Ans.* 28*l.*
197.	1 ton, at 6d. per pound.	*Ans.* 56*l.*
198.	1 ton, at 2d. per pound.	*Ans.* 18*l.* 13*s.* 4d.
199.	1 ton, at 4d. per pound.	*Ans.* 37*l.* 6*s.* 8d.
200.	1 ton, at 5d. per pound.	*Ans.* 46*l.* 13*s.* 4d.
201.	1 ton, at 7d. per pound.	*Ans.* 65*l.* 6*s.* 8d.
202.	1 ton, at 8d. per pound.	*Ans.* 74*l.* 13*s.* 4d.
203.	1 ton, at 9d. per pound.	*Ans.* 84*l.*
204.	1 ton, at 10d. per pound.	*Ans* 93*l.* 6*s.* 8d.
205.	1 ton, at 11d. per pound.	*Ans.* 102*l.* 13*s.* 4d.

PROBLEM.

By knowing the price of one pound in farthings, to find the price of a ton weight.

THIS IS THE RULE. Multiply the price of one pound in farthings by seven, and divide by three for the answer.

Examples.

206. If 1 lb of iron cost 1¾d., what cost 1 ton?

farthings.
7
7
3)49
£16 6 8 *Ans.*

207. If 1 lb of iron cost 2⅓d., what will 1 ton cost?

farthings.
10
7
3)70
£23 6 8 *Ans.*

PROBLEM.

By knowing the price of a ton, to find the price of a pound.

THIS IS THE RULE. Multiply the price of a ton by three, and divide by seven, you will have the answer in farthings.

Examples.

208. If 1 ton of iron cost 16*l.* 6s. 8d., what is that a pound?

£.	s.	d.	
16	6	8	
		3	
7)49	0	0	
7	0	0	farthings=1¾d. *Ans.*

209. If 1 ton weight of any thing cost 23*l.* 6s. 8d., what is it per pound?

£.	s.	d.	
23	6	8	
		3	
7)70	0	0	
10	0	0	farthings=2½d. *Ans.*

PROBLEM.

To reduce cwts., quarters, and pounds into barrels, stones, and pounds.

THIS IS THE RULE. Multiply the cwts. by eight, the quarters by two, and to the sum of both the products add the stone and pounds in the odd pounds (if any), then divide the total by the number of stones in the barrel, the quotient will be the answer.

210. In 12 cwts. 3 qrs. 21 lbs., how many barrels of wheat, oats, and barley?—Answer,—5 barrels, 3 stones, 7 lb wheat; 7 barrels, 5 stones, 7 lb oats; 6 barrels, 7 stones 7 lb barley.

PROBLEM.

By having the price of a stone, to know the amount of a barrel.

THIS IS THE RULE. The number of farthings which a stone costs, will be the price of the barrel in shillings.

211. At 1¾d. per stone, what does a barrel containing forty-eight stones come to?

SOLUTION. One penny three-farthings, is seven farthings, that is seven shillings per barrel. Reverse this, and for every shilling the barrel costs, you will have a farthing per stone.

PROBLEM.

By having the price of a stone, to know the amount per barrel containing 64 stones.

THIS IS THE RULE. To the farthings, which one stone costs *add one-third* thereof, for the price of the barrel in shillings.

Example.

212. At 5¾d. per stone, what will 64 stones cost?

23 farthings.
One-third 7s. 8d.
30s. 8d. per barrel.

PROBLEM.

To calculate the amount of the barrel, containing 100 *stones.*

THIS IS THE RULE. Multiply two and a penny by the farthings per stone, the product will be the amount.

Example.

213. At 2¼d. per stone, what is the value of 100 stones?

Multiply 2s. 1d. by 9, produces 18s. 9d., the answer.

TO REVERSE THIS RULE. Multiply the price of the barrel by twelve, the one-fifth of the product in pounds will be the price per stone in pence.

PROBLEM.

By having the price of one, to know the amount of ninety-six.

THIS IS THE RULE. The price per integer in half-farthings, will be the amount in shillings. Or, write the price per integer in pence as shillings, which multiply by eight for the answer.

214. At 3¼d. per stone of potatoes, what is the price of a barrel, containing 96 stones.

Threepence farthing or 26 half-farthings, that is 26s. or 1*l.* 6s. per Rule. Or, 3s. 3d. multiplied by eight, produces 1*l.* 6s., the answer per the dozens, part the first.

PROBLEM.

To calculate the price of the barrel of 40 *stones.*

THIS IS THE RULE. Call the pence per stone pounds, &c., the one-sixth thereof will be the amount. Or, if the price per stone be expressed in shillings, its double will be the amount in pounds.

215. At 18¾d. per stone of wheat, what is that per barrel of 40 stones?—18*l.* 15s. its one-sixth, is 3*l.* 2s. 6d. per barrel as required.

PROBLEM.

By having the price per gallon, to know the cost price per tun.

THIS IS THE RULE. Write the pence which the gallon costs as pounds, which augment by its one-twentieth, the sum will be the cost per tun.

216. At 6s. 7½d. per gallon, what is that per tun?

	£.	s.	d.
	79	10	0
One-twentieth	3	19	6
	£83	9	6 *Ans.*

PROBLEM.

By having the cost per tun, to know the cost per gallon.

THIS IS THE RULE. Divide the cost per tun in shillings by twenty-one, the quotient will be the cost per gallon in pence.

217. At 4*l.* 10s. 6d. per tun, what is that per gallon?

	£.	s.	d.
	84	10	6
One-twenty-first	4	0	6
	£80	10	0 i.e. 80½d. or 6s. 8½d. per gallon.

218. If a tun of spirits cost 78*l.* 15s., what will 1 gallon cost? *Ans.* 6s. 3d.

PROBLEM.

By having the price per gallon, to know the price per hogshead.

THIS IS THE RULE. Take the one-fifteenth of the farthings as pounds, from which deduct the cost of one gallon, for the price per hogshead.

Example.

219. At 5s. 7¾d. per gallon, what is that per hogshead?

	271 farthings in the price		
One-fifteenth	18	1	4
		5	7¾
	£17	15	8¼ *Ans.*

PROBLEM.

By knowing the price per glass, to know the cost per gallon.

THIS IS THE RULE. To the farthings per glass, add one-third thereof for the cost price per gallon in shillings.

PROBLEM.

By knowing the price per glass, to know the cost per hogshead.

THIS IS THE RULE. Multiply four pounds four shillings by the price per glass in farthings for the cost per hogshead, and you have *the answer in* pounds and shillings.

Example.

220. At 1¼d. per glass, what is that per hogshead?

£.	s.
4	4
	6
£25	4 *Ans.*

PROBLEM.

By knowing the price per hogshead, to know the cost per glass.

THIS IS THE RULE. From the price of the hogshead in pounds, deduct its one-twenty-first part, the pounds that remain will be one-fourth farthings per glass, and for every five shillings (if any), count the one-sixteenth of a farthing.

Example.

221. At 25*l.* 4s. per hogshead, what is that per glass?

	£.	s.	
	25	4	
One-twenty-first part	1	4	
	24		One-fourth farthings, or 1¼d. per glass.

PROBLEM.

By knowing the price per gallon of porter, to know the value of a tierce.

THIS IS THE RULE. From the farthings per gallon, considered as shillings, but written in pounds, deduct its one-eighth, the remainder will be the cost per tierce.

Example.

222. At 15¼d. per gallon of porter, what is that per tierce?

	£.	s.	d.	
62 farthings, or	3	2	0	
One-eighth	0	7	9	
	£2	14	3	*Ans.*

PROBLEM.

By having the cost per tierce, to know the cost per gallon.

THIS IS THE RULE. To the price of the gallon in shillings, add its one-seventh, the shillings of the sum will be the cost per gallon in pence, and for every odd penny (if any), allow the same part of a penny to the gallon that those are of a shilling.

Examples.

223. At 28s. per tierce, what is that per gallon?

28s.

One-seventh 4

32 farthings, or 8d. per gallon.

PROBLEM.

By having the price of a pint, to know the cost per tierce.

THIS IS THE RULE. Seven times the price of a pint in farthings, will be the cost per tierce in shillings.

Example.

224. At 2d. per pint, what is that per tierce?

$7 \times 8 = 56$s. or £2. 16s. per tierce.

PROBLEM.

By knowing the price of a tierce, to know the price per pint.

THIS IS THE RULE. The one-seventh of the price of a tierce in shillings, will be the price per pint in farthings.

Example.

225. At 56s. per tierce, what is that per pint?

56s.

One-seventh 8 farthings, or twopence per pint.

In all such cases as the above, allow for the pence the same part of a farthing that those are of a penny.

PROBLEM.

How to estimate, tuns, hogsheads, and gallons.

THIS IS THE RULE. Call the tuns pounds, five times the hogsheads, shillings, and the gallons minus the twenty-first part of the same pence, which set down mentally, and this, multiplied by the price per tun in pounds, gives the amount.

Example.

226. At 5s. per gallon, what is 25 tuns, 3 hhds, 21 gallons worth?

tuns.	hhds.	gals.
25	3	21
63	$15\frac{3}{4}$	$\frac{1}{4}$
£1627	10	0

PROBLEM.

By knowing the price per nail, to know the cost per yard.

THIS IS THE RULE. Take one-third of the price of the nail in *farthings*, for the price per yard in shillings.

THE REVERSE IS THIS.—Three times the price of a yard in shillings, will be the cost per nail in farthings.

PROBLEM.

By knowing the price of a yard, quarter, or nail, to compute the amount of any number of yards, quarters, and nails.

THIS IS THE RULE. Call the yards pounds, five times the quarters, shillings, and fifteen times the nails pence; which, when properly collected, will be the amount at a pound per yard; then, if the price be more or less, add to, or subtract from the amount such proportionable parts of the same as the excess or deficiency is of a pound.

But when the price per yard is low, call the yards groats, the quarters pence, and the nails farthings, which being brought into farthings per nail, express the value required.

Example.

227. What is 24 yards, 3 qrs. 2 nails, at 1¾d. per nail?

yds.	qrs.	na.
24	3	2
lg.	ld.	1 farthing
0	8	$3\frac{1}{2}\times 7 = £2.\ 18s.\ 0\frac{1}{2}d.$ *Ans.*

A NEW AND MOST CONCISE METHOD OF TROY WEIGHT.

PROBLEM.

By knowing the price per grain, to know the cost per ounce.

THIS IS THE RULE. The cost per grain in halfpence, will be the cost per ounce in pounds; and, *vice versa*, the cost per ounce in pounds will be the value of the grain in halfpence.

Example.

At four halfpence per grain, it will be 4*l.* per ounce; and at 4*l.* per ounce, it will be four halfpence per grain.

PROBLEM.

By knowing the price per pennyweight, to know the amount of any number of pounds.

THIS IS THE RULE. The product of the price per pennyweight in pence, and the proposed number of pounds, will be the amount. THUS.—At 4d. per pennyweight, 80 lb. will cost 320*l.*

PROBLEM,

By knowing the price of an ounce troy, to compute the value of any number of pounds, ounces, pennyweights, and grains.

THIS IS THE RULE. Reduce the pounds mentally to ounces,

which increase by the given ounces, then call the sum pounds, the pennyweights shillings, and half the grains pence, of which take such parts of the same as the price per ounce is of a pound.

Example.

228. At 5s. 6d. per ounce, what is the value of 10 lb. 6 dwts. and 14 grains?

	lbs.	oz.	dwts.	grs.
	10	0	6	14
	3	5	3	$\frac{1}{8}$
	33	1	$7\frac{3}{4}$	
One-tenth	3	0	$1\frac{1}{4}$	
	£33	1	$9\frac{1}{8}$	*Ans.*

☞ Five shillings per ounce, is £1. per lb., and the pennyweight and grain are estimated in proportion, then to the amount thus produced, add its one-tenth, being the reciprocal of the number of sixpences contained in five shillings.—Unmercantile fractions, in all such cases, are to be omitted.

PROBLEM.

By knowing the price of an ounce troy, to know the value of any number of pounds.

THIS IS THE RULE. Multiply the pence per ounce, by the proposed number of lbs., the product will be the answer in shillings.

Example.

229. At $4\frac{1}{2}$d. per ounce, what is the value of 7 lb.?

$4\frac{1}{2}$d.
7
31 6 or 1*l* 11s. 6d. as required.

PROBLEM.

By having the price of a dwt. in farthings, to find what one pound costs.

THIS IS THE RULE. Take $\frac{1}{4}$ of the price of a dwt. in farthings, and the quotient will be the answer in pounds.

Examples.

230. If 1 dwt. of silver cost $3\frac{1}{4}$d., what will 1 lb. cost?

4÷13
£3 5 0 *Ans.*

231. If a dwt. of silver cost 5d., what will 1 lb. cost? *Ans.* 5*l.*

232. If a dwt. of silver cost $4\frac{3}{4}$d., what will 1 lb. cost?

4÷19
£4 15 *Ans.*

PROBLEM.

If the quantity be any number of pounds.

RULE. Multiply the price of a dwt. in farthings, and the given number of pounds together; divide that product by 4 for the answer.

Examples.

233. If 1 dwt of silver cost 4¾d., what will 24 lb. cost?

24
19
4 ÷ 456
£114 *Ans.*

234. If a dwt. cost 6¼d., what will 36 lb. come to? *Ans.* 225*l.*

235. If 1 dwt. cost 7½d., what will 48 lb. cost? *Ans.* 360*l.*

PROBLEM.

By having the price of one, to know the value of a thousand.

THIS IS THE RULE. Call the pence pounds, which multiply by four and the one-sixth for the answer.

Examples.

236. At 1¾d. per yard, what will 1000 yards cost?

£.	S.	D.
1	15	0
		4⅙
7	0	0
	5	10
£7	5	10 *Ans.*

237. *1000 yards broad cloth, at 7s. 9d. per yd. *Ans.* 387*l.* 10s.

238. 1000 yards of Linen, at 2s. 7½d. per yard? *Ans.* 131*l.* 5s.

239. 1000 gallons of Cogniac, at 14s. 7d. yer gallon. *Ans.* 729*l.* 3s. 4d.

240. 1000 barrels of herrings, at 19s. 9¾d. per barrel. *Ans.* 990*l.* 12s. 6d.

241. 1000 loads of oatmeal, at 1*l.* 13s. 9d. per load *Ans.* 1687*l.* 10s.

242. 1000 planks of larchwood, at 11s. 10½d. per plank. *Ans.* 593*l.* 15s.

243. 1000 gallons of Oil, at 16s. 5d. per gallon. *Ans.* 820*l.* 16s. 8d.

244. 1000 yards of green baize, at 7s. 9d. per yard. *Ans.* 387*l.* 10s.

*The reason of multiplying by four and one-sixth is evident; as four and one-sixth times 240 is 1000. Hence, four and one-sixth will apply generally where the price of 1000 is required, the rate for one being given.

245. 1000 pounds of silver, at 3*l.* 5s. per pound. *Ans.* 3250*l.*

246. 1000 perches of mason work, at 3s. 9d. per perch. *Ans.* 187*l.* 10s.

247. 1000 acres of land, at 15s. 9d., what is that yearly? *Ans.* 787*l.* 10s.

248. The grazing of 1000 head of cattle, at 19s. 8d. a piece, what does it come to? *Ans.* 983*l.* 6s. 8d.

PROBLEM.

To reverse the above, when the price of the thousand is an integral number of pounds.

THIS IS THE RULE. From the price in pounds take four times said pounds, keeping the product two figures to the right of the digit's price, the remainder will be the farthings per integer, saving the two last digits, which will be centescimal parts of a farthing.

Example.

249. Suppose 1000 yards cost 25*l.* what is that per yard?

£25
100
24,00 Farthings or 6d. per Rule the first.

PROBLEM.

By having the price of 100, *to know the value of* 1000.

THIS IS THE RULE. Half the number of shillings will count pounds; and add a cypher to the number of pence, you have the pence.

Examples.

250. 1000 bricks, at 8s. 4d. per hundred.

	£.	s.	d.
Per rule, the half of 8 is=	4	0	0
Add 0 to the pence is 40=	0	3	4
	£4	3	4 *Ans.*

251. 1000 paving tiles, at 4s. 7d. per hundred. *Ans.* 2*l.* 5s, 10d.

252. 1000 needles, at 2s. 4d. per hundred. *Ans.* 1*l.* 3s. 4d.

253. 2000* herrings, at 5s. 8d. per hundred. *Ans.* 5*l.* 13s. 4d.

254. 1000 bodkins, at 4d. the hundred. *Ans.* 3s. 4d.

255. 3000 knife handles, at 1s. 5d. per hundred. *Ans.* 2*l.* 2s. 6d.

256. 2000 oranges, at 12s. 3d. per hundred. *Ans.* 12*l.* 5s.

257. 1000 plants, at 5s. 1d. per hundred? *Ans.* 2*l.* 10s. 10d.

258. 1000 eightpenny nails, at 4d. per hundred? *Ans.* 3s. 4d.

259. 1000 iron hooks, at 8½d. per hundred? *Ans.* 6s. 10½d.

*When there are 2000 call the shillings pounds, and double the pence before you add the 0. If 3000, add half as many more to the shillings, *and treble* the pence, and so on if the numbers be higher.

260. 2000 iron piercers, at 6d. per hundred? *Ans.* 10*s.*

261. 1000 yards of twine, at 2s. 8d. per hundred yards? *Ans.* 1*l.* 6s. 8d.

262. 1000 pounds of linen thread, at 7s. 6d. per hundred pounds? *Ans.* 3*l.* 15s.

263. 1000 pounds of cheese, at 2*l.* 10s. 6d. per hundred pounds? *Ans.* 25*l.* 5s.

264. 1000 pounds of tea, at 25*l.* 6s. 9d. per hundred pounds? *Ans.* 253*l.* 7s. 6d.

265. 1000 pantiles, at 3s. 6d. per hundred?

The $\frac{1}{2}$ of 3s. is=	1	10	0
Add 0 to 6d. is 60d.=		5	0
	£1	15	0 *Ans.*

266. 1000 slates, at 7s. 6d. per hundred? *Ans.* 3*l.* 15s.

267. 1000 nails, at 10d. the hundred? *Ans.* 8s. 4d.

268. 1000 bodkins, at 4s. 1d. per hundred? *Ans.* 2*l.* 0s. 10d.

269. 1000 flower-pots, at 6$\frac{1}{2}$d. per hundred? *Ans.* 5s. 5d.

270. 1000 stone jars, at 1s. 2$\frac{1}{4}$d. per hundred? *Ans.* 12s. 10$\frac{1}{2}$d.

271. 1000 iron bolts, at 2s. 1$\frac{3}{4}$d. per hundred? *Ans.* 1*l.* 1s 5$\frac{1}{2}$d.

272. 2000 stone jugs, at 4s. 2$\frac{3}{4}$d. per hundred? *Ans.* 4*l.* 4s. 7d.

273. 3000 brass nails, at 9d. per hundred? *Ans.* 1*l.* 2s. 6d.

274. 1000 yards of inkle, at 1s. 2$\frac{1}{2}$d. per hundred? *Ans* 12s. 1d.

275. 1000 brass rings, at 9$\frac{1}{4}$d. per hundred? *Ans.* 7s. 8$\frac{1}{2}$d.

276. 1000 yards of silk, at 34*l.* 17s. 6d. the 100 yards? *Ans.* 348*l.* 15s.

277. 1000 yards of cambric, at 45*l.* 15s. 10d. the 100 yards? *Ans.* 457*l.* 18s. 4d.

278. 1000 tons of coals, at 97*l.* 18s. 4d. the 100 tons? *Ans.* 979*l.* 3s. 4d.

279. 1000 loads of flour, at 157*l.* 17s. 6d. the 100 loads? *Ans.* 1578*l.* 15s.

Problem.

By having the price of 112 *lbs., to know the value of an ounce.*

This is the Rule. To half the price of 112, add the one-fourteenth, the pounds of the sum will be the farthings per ounce.

Example.

280. At £28. per 112 lb., what is that per ounce?

	£28
One-fourteenth	2
	30 Half-farthings, or 3$\frac{3}{4}$d. *Ans.*

THE REVERSE OF THE FOREGOING RULE. From the cost per ounce in half-farthings, deduct its one-fifteenth, the remainder will be the amount of 112 lbs. in pounds.

Example.

281. At 6d. per ounce, what is that per 112 lb.?

48 half-farthings

One fifteenth 3 4

£44 16 *Ans.*

TABLE OF SALARIES, &c., FROM £1. TO £150. PER ANNUM, THE SAME REDUCED TO SO MUCH PER MONTH, PER WEEK, PER DIEM.

Y.	M.		W.		D.		Y.	M.			W.			D.		Y.	M.			W.			D.	
£.	s.	d.	s.	d.	s.	d.	£.	£.	s.	d.	s.	d.	s.	d.	£.	£.	s.	d.	£.	s.	d.	s.	d.	
1	1	8	0	4 3/4	0	0 3/4	11	0	18	4	4	2 3/4	0	7 1/2	30	2	10	0	0	11	6	1	7 3/4	
2	3	4	0	9 1/2	0	1 1/4	12	1	0	0	4	7 1/2	0	8	40	3	6	8	0	15	4	2	2 1/2	
3	5	0	1	1 1/4	0	2	13	1	1	8	4	11 3/4	0	8 1/2	50	4	3	4	0	19	2 1/4	2	9	
4	6	8	1	6 1/2	0	2 3/4	14	1	3	4	5	4 1/2	0	9 1/4	60	5	0	0	1	3	0 1/2	3	3 1/2	
5	8	4	1	11	0	3 1/4	15	1	5	0	5	9	0	10	70	5	16	8	1	6	10 1/4	3	10	
6	10	0	2	3 1/2	0	4	16	1	6	8	6	1 3/4	0	10 1/2	80	6	13	4	1	10	8 1/4	4	4 1/2	
7	11	8	2	8 1/4	0	4 1/2	17	1	8	4	6	6 1/4	0	11 1/4	90	7	10	0	1	14	6 1/2	4	11 1/4	
8	13	4	3	0 1/2	0	5 1/4	18	1	10	0	6	10 3/4	0	11 3/4	100	8	6	8	1	18	4 1/4	5	5 3/4	
9	15	0	3	5 1/4	0	6	19	1	11	8	7	3 1/2	1	0 1/4	125	10	8	4	2	7	11 1/2	6	10 1/4	
10	16	8	3	10	0	6 1/2	20	1	13	4	7	8	1	1 1/4	150	12	10	0	2	17	6 1/2	8	2 3/4	

PROBLEM.

By knowing the daily wages, to know the yearly salary.

THIS IS THE RULE. Call the pence pounds, to which add half thereof, and five days wages; collect these items into one total for the answer.

OR THUS, BY A WELL KNOWN RULE. For every penny per day, it will be one pound, one half-pound, one groat, and one penny per year.

Example.

282. At 15¾d. per day, what is the amount per annum?

£.	S.	D.	
15	15	0	the amount of 240
7	17	6	the amount of 120
0	6	6¾	the wages of five days.
£23	19	0¾	yearly salary.

PROBLEM.

By knowing the yearly salary, to know the daily wages.

THIS IS THE RULE. Double the annual salary in pounds, the one-third thereof will be the price per day. Observe—when the shillings are ten or more, to double the pounds add one, but if less than ten, they are not to be taken into consideration. You are further to observe—if after the division of three, one should remain, allow it a half-penny; but if two remains, allow three farthings.

Example.

283. A servant's wages is 23*l.* 19s. 0¾d., yearly, what is that per day.

23
2
3÷47
15¾d. nearly per day.

PROBLEM.

To find what any number of pence per day will amount to in a year.

THIS IS THE RULE. Add together as many pounds, half-pounds, fourpences, and pence, as there are pence per day. Thus, threepence per day is three pounds, three half-pounds, three fourpences, and threepence, in a year; that is four pounds, eleven shillings, and threepence.

REASON. Because, 1*l.*=240d., 10s..=120d., 4d. and 1d.

And 240+120+4+1=365.

Or take three hundred and sixty-five as pence; that is one pound, ten shillings, and fivepence, and multiply this by the number of pence per day.

284.	365 days, at 2d. per day	*Ans.* 3*l.* 0s. 10d.
285.	365 days, at 4d. per day.	*Ans.* 6*l.* 1s. 8d.
286.	365 days, at 5d. per day.	*Ans.* 7*l.* 12s. 1d.
287.	365 days, at 6d. per day.	*Ans.* 9*l.* 2s. 6d.
288.	365 days, at 7d. per day.	*Ans.* 10*l.* 12s. 11d.
289.	365 days, at 8d. per day.	*Ans.* 12*l.* 3s. 4d.
290.	365 days, at 9d. per day.	*Ans.* 13*l.* 13s. 9d.
291.	365 days, at 10d. per day.	*Ans.* 15*l.* 4s. 2d.
292.	365 days, at 16d. per day.	*Ans.* 24*l.* 6s. 8d.
293.	365 days, at 18d. per day.	*Ans.* 27*l.* 7s. 6d.
294.	¼ year, at 14d. per day.	*Ans.* 10*l.* 12s. 11d.
295.	¼ year, at 20d. per day.	*Ans.* 7*l.* 12s. 1d.

PROBLEM.

To find what any number of pence per day will amount to, in 313 *days, which is the number of week-days in a year, omitting sundays.*

THIS IS THE RULE. Add together as many pounds, crowns, shillings, and pence, as there are pence per day. Thus, threepence per day, is three pounds, three crowns, three shillings, and threepence per year, of three hundred and thirteen days: that is three pounds eighteen shillings and threepence.

REASON. Because 1*l.*=240d., 1 crown=60d., 1s.=12d., 1d.
And 240+60+12+1=313.
Or multiply £1. 6s. 1d.=313d. by the number of pence, per day.

296. 313 days, at 2d. per day. *Ans.* 2*l.* 12s. 2d.
297. 313 days, at 5d. per day. *Ans.* 6*l.* 10s. 5d.
298. 313 days, at 6d. per day. *Ans.* 7*l.* 16s. 6d.
299. 313 days, at 7d. per day. *Ans.* 9*l.* 2s. 7d.
300. 313 days, at 13d. per day. *Ans.* 16*l.* 19s. 1d.
301. 313 days, at 14d. per day. *Ans.* 18*l.* 5s. 2d.
302. 313 days, at 20d. per day. *Ans.* 26*l.* 1s. 8d.
303. 313 days, at 60d. per day. *Ans.* 78*l.* 5s.

NOTE. Should there be farthings in the rate per day, add for every farthing in the rate, 7s. 7¼d. for 365 days, and 6s. 6¼d. for 313 days.

REASON. Because, 7s. 7¼d.=365 farthings, and 6s. 6¼d.=313 farthings.

304. 365 days, at 2¼d. per day. *Ans.* 3*l.* 8s. 5¼d.
305. 365 days, at 3¼d. per day. *Ans.* 4*l.* 18s. 10¼d.
306. 365 days, at 6¼d. per day. *Ans.* 9*l.* 17s. 8¾d.
307. 313 days, at 2¼d. per day. *Ans.* 2*l.* 18s. 8¼d.
308. 313 days, at 3¼d. per day. *Ans.* 4*l.* 4s. 9¼d.
309. 313 days, at 6¼d. per day. *Ans.* 8*l.* 9s. 6¾d.

PROBLEM.

To find what any number of shillings per week will amount to in a year.

THIS IS THE RULE. Add together twice and a-half as many pounds, and twice as many shillings, as there are shillings per week. Thus, 6s. per week is £15. 12s.; for twice as many pounds is £12.; and half as many pounds is £3.; and twice as many shillings is 12s.; and £12.+£3.+12s.=£15. 12s.

REASON. Because 52, the number of weeks in a year, is equal to 20+20+10+2=52.

310. 1 year, at 4s. per week. *Ans.* 10*l.* 8s.
311. 1 year, at 5s. per week. *Ans.* 13*l.* 0s.
312. 1 year, at 6s. per week. *Ans.* 15*l.* 12s.
313. 1 year, at 7s. per week. *Ans.* 18*l.* 4s.

314.	1 year, at 8s. per week.	*Ans.* 20*l.* 16s.
315.	1 year, at 9s. per week.	*Ans.* 23*l.* 8s.
316.	1 year, at 10s. per week.	*Ans.* 26*l.* 0s.
317.	1 year, at 11s. per week.	*Ans.* 28*l.* 12s.
318.	1 year, at 12s. per week.	*Ans.* 31*l.* 4s.
319.	1 year, at 16s. per week.	*Ans.* 41*l.* 12s.
320.	1 year, at 17s. per week.	*Ans.* 44*l.* 4s.
321.	1 year, at 19s. per week.	*Ans.* 49*l.* 8s.

PROBLEM.

To find what any number of pence per week will amount to in a year.

THIS IS THE RULE. Take four times as many shillings, and four times as many pence, as there are pence per week, and if there be farthings in the rate, add one shilling and a penny, for every farthing

REASON. Because, 52d.=4s. 4d., and 52 farthings=13d., or 1s. 1d

322.	1 year, at 2d. per week.	*Ans.* 8s 8d.
323.	1 year, at 3d. per week.	*Ans.* 13s. 0d.
324.	1 year, at 4d. per week.	*Ans.* 17s. 4d.
325.	1 year, at 7d. per week.	*Ans.* 30s. 4d.
326.	1 year, at 9d. per week.	*Ans.* 39s. 0d.
327.	1 year, at 11d. per week.	*Ans.* 47s. 8d.
328.	1 year, at 2¼d. per week	*Ans.* 9s. 9d.
329.	1 year, at 3½d. per week.	*Ans.* 15s. 2d.
330.	1 year, at 4¾d. per week.	*Ans.* 18s. 5d.
331.	1 year, at 7¼d. per week.	*Ans.* 33s. 7d.
332.	1 year, at 9⅓d. per week.	*Ans.* 41s. 2d.
333.	1 year, at 11¾d. per week.	*Ans.* 50s. 11d.

PROBLEM.

To compute the amount of any number of cwts., quarters, and pounds of wheat, oats, or barley, at any proposed price per stone or barrel.

THIS IS THE RULE.—At one shilling per stone, it will be eight shillings per cwt., two shillings per quarter, and the six-seventh of a penny per pound. And when the cwts., &c., are correctly computed, you have the value of the wheat, oats, or barley, at as many shillings per barrel as there are stones in the barrel; then, if the price per barrel be more or less than a shilling per stone, to the amount thus produced add or subtract from the same such proportionable parts as the excess or deficiency is of a shilling, or which is the same in effect, such proportionable parts as the excess or deficiency is of as many shillings as there are stones in the barrel.

Example.

334. What is the amount of 24 cwt., 2 qrs., 18lb. of corn, at £1·

10s. per barrel of wheat, £1. 1s. for oats, or £1. 4s. per barrel of barley imperial measure, or which is the same, at 18d. per stone?

	cwts.	qrs.	lbs.	
	24	2	18	
	8	2		Six-seventh.
	9	17	3½	
Six are one-half	4	18	7¾	
	£14	15	11¼	*Ans.*

PROBLEM.

To reduce Irish miles to English.

THIS IS THE RULE.—To the Irish miles add four times the same, and lack a figure to the right, the one-eleventh of the sum will be English miles; and the reverse, to the English add the same, lacking a figure to the right, the one-seventh of half the sum will be Irish miles.

PROBLEM.

To reduce Plantation to Statute Acres.

THIS IS THE RULE. Double the Irish acres, and from it take twice the double, lacking two figures to the right, the one one-hundred-and-twenty-first part of the remainder will be statute acres.

OR THUS. Multiply the Irish acres by one hundred and ninety-six, and divide the product by one hundred and twenty-one, the quotient will be statute acres.

Example.

335. In 484 Irish acres, how many English?

968
1936
121)94864
784 English, per Rule the first.

PROBLEM.

To reduce English to Irish acres, or statute to plantation.

THIS IS THE RULE. To the English acres add twelve times the same, keeping one figure to the left, the one forty-ninth of the sum will be roods in plantation measure.

Example.

336. In 784 English acres, how many plantation acres?

3920
47040
474320
One forty-ninth 9680
484.000 That is 484 acres.

PROBLEM.

To multiply acres, roods, and perches, by acres, roods, and perches.

THIS IS THE RULE.—Acres, multiplied by acres, produce acres; acres, multiplied by roods, produce roods; acres, multiplied by perches produce perches; roods, multiplied by roods, the one-fourth of the product is roods; roods, multiplied by perches, the one-fourth of the product is perches; perches multiplied by perches, the one hundred and sixtieth of the product is perches.

Example.

338. Multiply 12A. 3R. 16P. by 7A. 2R. 20P. *Ans.* 84A. 1R. 22P.

PROBLEM.

To reduce pounds, shillings, and pence, into the form of cwts., quarters, and pounds.

THIS IS THE RULE. Allow one cwt. to the pound; the one-fifth of a quarter to the shilling, and the seven-fifteenth of a lb. to the penny, then proceed according to the explanation in the preceding Rule.

PROBLEM.

To reduce pounds, shillings, and pence, to the form of yards, quarters, and nails.

RULE. Allow one yard to the pound, the one-fifth of a quarter to the shilling, and the one-fifteenth of a nail to the penny, and it is done.

PROBLEM.

To reduce pounds, shillings, and pence, to the form of barrels, stones, and pounds of wheat.

THIS IS THE RULE. Allow one barrel to the pound, one stone to the shilling, and one and the one-sixth of a pound to the penny; that is, mentally, the sixth part of seven times the pence will be pounds. Write the shillings as stones, and the pounds as barrels; then, if required, proceed as directed in the first example: an imperial barrel of wheat contains 20 stones.

This mode of calculation may be extended to all cases of a similar nature—as, for instance, any quantity either weighed or measured, by the above reasoning may be reduced to the form of pounds, shillings, and pence, and *vice versa*.

PROBLEM.

To multiply cwts., quarters, and pounds, by cwts., quarters, and pounds.

THIS IS THE RULE. Cwts. multiplied by cwts., produce cwts.,

cwts. multiplied by quarters, produce quarters; cwts. multiplied by pounds, produce pounds; and cwts. multiplied by half pounds, or quarter pounds., produce half or quarter pounds; quarters multiplied by quarters, the one-fourth of the product is quarters; quarters multiplied by pounds, half-pounds. or quarter-pounds, the one-fourth of the product is pounds. half-pounds, or quarter-pounds; pounds multiplied by pounds, the one hundred and twelfth part of the product is pounds.

Example.

337. What is the product of 12 cwt. 3 qrs. 27½ lbs. by 15 cwt. 1 qr. 11½lbs. ?, *Ans.* 180 cwt. 0 qrs. 23¼ lbs.

NEW METHOD OF EXTRACTING THE SQUARE ROOT.

PROBLEM.

A new and expeditious method for extracting the square root, never before discovered. It has many advantages. It can be learned with the greatest facility, and after the same manner, may any root be extracted, such as the cube, biquadrate, sursolid, &c., &c.

THIS IS THE RULE. Divide the given number whose root is to be extracted, by some digit involved to the same power; divide the quotient by the latter divisor, or by a like power of some other digit; continue the division till one or some small insignificant remainder occurs, and choose, if possible, such divisors as the dividend will contain without a remainder. Then the required root, taken of the different divisors, will be always rational, and these multiplied into each other will be the true root, if there be no remainder; but if a remainder occurs place the root thus found drawn into the index of the power beneath, the excess of the given number whose root is to be extracted, above the product of the respective divisors, which increment must be affixed to the rational root for the root of the required number, sufficiently correct for any practical purpose. Hence the operator will at once see the necessary change that will make the operation conclusive.

Example.

339. What is the square root of 144?

First, divide 144 by 16, and divide the quotient by 9; then, 16 and 9 are the divisors, whose root are 4 and 3, the product of these will be 12, which is the root required.

Next, if the number was irrational, as seven hundred and twenty, *and that its* root was required?

First, divide by nine, then by sixteen, and next by four; then nine, sixteen, and four, are the divisors, and one hundred and forty-four the remainder. Hence, the root of the rational part of seven hundred and twenty is twenty-four, and its double, placed beneath one hundred and forty-four. This fraction affixed to twenty-four, gives twenty-seven for the root, nearly.

CALCULATION OF INTEREST ACCORDING TO THE BANKING SYSTEM.

PROBLEM.

To calculate the interest of any principal for ninety-one, sixty-one, or thirty-one days, at any proposed rate per cent per annum.

RULE. For ninety-one days, the interest will be threepence per pound; sixty-one days, the interest will be two-pence per pound; for thirty-one days, the interest will be one penny per pound, nearly.

PROBLEM.

To find the interest or discount upon any sum, at five per cent per annum.

THIS IS THE RULE. Reckon a shilling for every pound, and threepence for every five shillings.

Examples.

340.	Interest on 12*l.*, at 5*l.* per cent.	*Ans.* 12s.
341.	Interest on 42*l.*. at 5*l.* per cent.	*Ans.* 2*l.* 2s.
342.	Interest on 68*l.*, at 5*l.* per cent.	*Ans.* 3*l.* 8s.
343.	Interest on 75*l.*, at 5*l.* per cent.	*Ans.* 3*l.* 15s.
344.	Interest on 110*l.*, at 5*l.* per cent.	*Ans.* 5*l.* 10s.
345.	Interest on 98*l.*, at 5*l.* per cent.	*Ans.* 4*l.* 18s.
346.	Interest on 26*l.* 5s., at 5*l.* per cent.	*Ans.* 1*l.* 6s. 3d.
347.	Interest on 47*l.* 10s., at 5*l.* per cent.	*Ans.* 2*l.* 7s. 6d.
348.	Interest on 69*l.* 15s., at 5*l.* per cent.	*Ans.* 3*l.* 9s. 9d.
349.	Interest on 87*l* 5s., at 5*l.* per cent.	*Ans.* 4*l.* 7s. 3d.
350.	Interest on 99*l.* 15s., at 5*l.* per cent.	*Ans.* 4*l.* 19s. 9d.
351.	Interest on 108*l.* 10s., at 5*l.* per cent.	*Ans.* 5*l.* 8s. 6d.

PROBLEM.

To find the interest on any sum, at five per cent per annum, for months.

THIS IS THE RULE. Take the pounds as pence, and multiply these pence by the number of months, for the answer in pence.

Examples.

352.	Interest on 4*l.* for 2 months.	*Ans.* 8d.
353.	Interest on 7*l.* for 3 months.	*Ans.* 1s. 9d.
354.	Interest on 9*l.* 10s. for 3 months.	*Ans.* 2s. 4½d.
355.	Interest on 72*l.* for 9 months.	*Ans.* 2*l.* 14s.
356.	Interest on 96*l.* 5s. for 3 months.	*Ans.* 1*l.* 4s. 0¾d.
357.	Interest on 144*l.* 15s. for 9 months.	*Ans.* 5*l.* 8s. 6¾d.

PROBLEM.

To Find the Interest on any sum, at five per cent, for any number of Days.

THIS IS THE RULE. Multiply either the money or the days by one-third of the money or the days; reject the units' figure and you have the answer in pence. Thus, the interest 27*l.* for 18 days: $27\times6=16(2=16$d.; or $18\times9=16)2=16$d. interest.

Examples.

358.	Interest on 21*l.* for 6 days.	*Ans.* 4d.
359.	Interest on 24*l.* for 7 days.	*Ans.* 5½d.
360.	Interest on 33*l.* for 9 days.	*Ans.* 9¾d.
361.	Interest on 41*l.* for 12 days.	*Ans.* 1s. 4½d.
362.	Interest on 76*l.* for 6 days.	*Ans.* 1s. 3d.
363.	Interest on 85*l.* for 15 days.	*Ans.* 3s. 6½d.
364.	Interest on 159*l.* for 27 days.	*Ans.* 11s. 11d.

PROBLEM.

To find the Interest on any sum, at six per cent, for months.

THIS IS THE RULE. Multiply the pounds and months; cut off the unit figure of the product, and the remainder will be the interest in shillings. The figure cut off is tenths of a shilling. Thus, the interest of 9*l.* at 6 per cent for 5 months, is $9\times5=4(5=4\frac{5}{10}$s.$=4$s. 6d.

Examples.

365.	Interest on 4*l.* for 3 months.	*Ans.* 2s. 1d.
366.	Interest on 12*l.* for 4 months.	*Ans.* 4s. 9d.
367.	Interest on 270*l.* for 7 months.	*Ans* 9*l.* 9s.
368.	Interest on 350*l.* for 8 months.	*Ans.* 14*l.*
369.	Interest on 90*l.* for 8 months.	*Ans.* 3*l.* 12s.
370.	Interest on 380*l.* for 9 months.	*Ans.* 17*l.* 2s.

THE SLIDING RULE.

THE SLIDING RULE is a kind of logarithmic table, and is so constructed as to obtain the solution of arithmetical questions in Multiplication, Division, and Extraction of the roots of numbers.

It is formed of two pieces of box-wood, each 12 inches in length, joined together by a brass folding joint. In one of the pieces there is a brass slider. The rules are commonly marked with A on the rule, B and C on the slider, and D on the girt or square line. Let the learner observe whatever value is given to the first 1 from the left, the numbers following, viz., 2, 3, 4, 5, &c., will represent twice, thrice, four times, &c. that value. If one is reckoned one, or unity, the rest will count 2, 3, 4, &c.; but if the one is reckoned ten, then 2, 3, 4, will count 20, 30, 40. Should the first one be called 100, then 2, 3, 4, &c. will count 200, 300, 400, &c. The value of the one in the middle of the line is always ten times that of the first one; the value of the second 2, is ten times that of the first 2; so that if the value of the first 1 be 10, that of the second 1 will be 100; the first 2 will be 20, and the second 2 will be 200, &c. On the lines A, B, and C, there are 50 small divisions betwixt 1 and 2, 2 and 3, 3 and 4, &c. Now, if the first 1 be reckoned 1, or unity each of the small divisions between 1 and 2, 2 and 3, &c. will be $\frac{1}{50}$ or ·02; and if you take the first 1 to be unity, then the small divisions from the second 1 to 2, 2 to 3, &c., will each be ten times greater than $\frac{1}{50}$, or ·02. each of them will be $\frac{10}{50}$ or $\frac{1}{5}$ or ·2. Again if 1 represents 100, the first 2 will be 200; if the second 1 be 1000, the second 2 will be 2000, and so on. The above being well understood, we shall now proceed to the use of the Rule.

PROBLEM.

To multiply by the sliding rule.

RULE. Set 1 on B to one of the factors on A; next against the factor on B, you have the product on A.

Examples.

371. Find the product of 3 by 8.

SOLUTION. Set 1 on B to 3 on A; then against 8 on B will be found the product 24 on A.

372. Find the product of 24 by 16.

SOLUTION. Set 1 on B against 16 on A, then look on B for 34, and against it on the line A will be found the product 544.

PROBLEM.

To divide by the sliding rule.

RULE. Set the divisor on B to the dividend on A; against 1 on B you have the quotient on A.

Examples.

373. Find the quotient of 96 divided by 6.

SOLUTION. Move the slider till 1 on B stands against 6 on A, then the quotient 16 will be found on B, against the dividend 96 on A.

374. What is the quotient of 108 divided by 12?

SOLUTION. Set 12 on B against 1 on A; on the line A will be found the quotient 9 against 108 on B.

PROBLEM.

Proportion by the sliding rule.

RULE. Set the first term on the slider B to the second on A; then on the line A will be found the fourth term, standing against the third term on B.

Example.

375. If 4 lb. of brass cost 36d., what will 12 lb. come to?

DIRECTION, Move the slider so that 4 on B will stand against 12 on A, then against 36 on B will be found the fourth term 108 on A.

PROBLEM.

Superficial measure by the sliding rule.

RULE. Multiply the length by the breadth, the product will be the area.

DIRECTIONS. Set 12 on B against the breadth in inches on A; on the line A will be found the surface in square feet against the length in feet on the line B.

Example.

376. What is the content of a plank 18 inches broad, and 10 feet 3 inches long?

DIRECTION. Move the slider so that 12 on B stands against 18 on A, then will 10¼ on B stand against 15¾ on A, which 15¾ is square feet.

PROBLEM.

To find the solid content of timber by the sliding rule.

Multiply length, breadth, and thickness together.

Set the length in feet on C to 12 on D, then on C will be found the content in feet against the square root of the product of the depth and breadth in inches on D.

Example.

377. What is the content of a square log of timber, the length of which is 10 feet, and the side of its square base is 15 inches?

Set 10 on C against 12 on D, then will 15 on D stand against the *content 15⅝ on C.*

PROBLEM.

To extract the square root by the sliding rule.

Move the slider so that the middle division on C, which is marked 1 stands against 10 on the line D, then against the given number on C, the square root will be found on D.

NOTE. If the given number consists of an even number of places of figures, as 2, 4, 6, &c., it is to be found on the left hand part of the line C; but if odd numbers as 3, 5, 7, &c., it is to be found on the right hand side of C, one being the middle point of the line.

Examples.

378. Find the square root of 81?

The number of places are even, being two, therefore the number 81 is sought for on the left hand side of the line C. Set 1 on C against 10 on D, then against 81 on C will be found 9, the square root on D.

379. What is the square root of 144?

Set 1 on C to 10 on D, then against 144 on C will be found the square root 12 on D.

TIMBER MEASURE.

Table.

1728	Cubical inches.....	make	1 cubical foot.
144	Square inches.....	make	1 square foot.
50	Feet solid round timber.....	make	1 ton.
40	Feet solid square timber.....	make	1 ton.
1	Cubical yard.....	make	27 cubical feet.

A load of rough timber=40 cubic feet; a load of square timber=50 cubic feet; a ton of shipping=40 cubic feet; a floor of earth=324 cubic feet; a cord of wood=8 feet long, 4 feet broad, and 4 feet deep=128 cubic feet; a stack of wood=12 feet long, 3 feet broad, and 3 feet deep=108 cubic feet; a solid yard of earth=1 load.

PROBLEM.

To find the area or superficial content of a board or plank.

THIS IS THE RULE. Multiply the length by the breadth, the product will be the content. When the board is tapering, add both ends together, and half the sum will be a mean breadth; then multiply the mean breadth by the length, the product will be the superficial content.

Examples.

380. In a board 12 feet long, and $8\frac{1}{2}$ inches broad, how many square feet? *Ans.* 8 feet, 6 inches.

381. What is the content of a plank 14 inches broad, and 16 feet 6 inches long? *Ans.* 19 feet, 3 inches.

382. In a board 15 feet 6 inches long, and 10 inches 6 sec. broad, how many square feet? *Ans.* 13 ft. 6 in. 9 sec.

383. Find the content of a plank $20\frac{3}{4}$ feet long, and $12\frac{1}{2}$ inches broad? *Ans.* 21 ft. 7 in. 4 sec. 6 th.

384. In a board $10\frac{1}{3}$ feet long, and $8\frac{1}{2}$ broad, how many square feet? *Ans.* 7 ft. 1 in. 3 sec,

☞ Observe if the two ends of a plank or board differ in breadth, add the two breadths and multiply the length by half the sum.

385. How many square feet in a board 12 feet 9 inches long, the breadth at one end being 15 inches, and at the other 10? *Ans.* 13 ft. 3 in. 4 sec. 6 th.

Problem.

To find the solidity of squared or four-sided timber.

This is the Rule. Multiply the mean breadth by the mean thickness, and the result by the length for the solidity. If the tree, throughout, be equally broad and thick, the breadth and thickness, any where taken, will be a mean breadth and thickness; but if it tapers regularly from one end to the other, the breadth and thickness, taken in the middle, will be a mean breadth and thickness. If the tree does not regularly taper, but in some places is thicker than others, find the content of each part separately.

Examples.

386. Required the solid content of a tree 16 feet long, and 14 inches the side of the square? *Ans.* 21 ft. 9 in. 4 sec.

387. What is the solid content of a tree 14 feet long, and $10\frac{1}{2}$ inches the side of the square? *Ans.* 10 ft. 8 in. 7 sec. 6 th.

388. What is the solid content of another tree 24 feet 6 inches long, and 20 in the side of the square? *Ans.* 68 ft. 8 sec.

389. If a piece of timber be $18\frac{1}{3}$ feet long, 14 inches broad, and 9 deep, what is the solid content? *Ans.* 16 ft. 2 in. 3 sec.

390. What is the solid content of a piece of timber or stone whose sides are 10 inches by 18, and the length 18 feet? *Ans.* 22 ft. 6 in.

391. What is the solid content of a piece of timber 15 feet 3 inches in length, breadth 15 inches, and depth $4\frac{1}{2}$ inches? *Ans.* 7 ft. 1 in. 9 sec. 4 th. 6 frths.

392. How much timber is there in a tree 2 feet 6 inches, by *1 foot 10 inches,* and $38\frac{3}{4}$ feet long? *Ans.* 177 ft. 7 in. 3 p.

PROBLEM.

To find the solidity of unsquared or round timber.

THIS IS THE RULE. Multiply the square by the square in inches, &c., and that product by the length in feet, &c., divide that product by 144, and you'l have the solid feet: if any should remain divide by 12 for inches.

Examples.

393. Admit a piece 20½ feet long, by 10¼ inches square, (which is a quarter of the line contained round the same), required the solid content in feet.

Inches 10.25
10.25
10506.25
20.5 Length
144÷2153(78.12.5
Feet 14.11 Inches, nearly.

394. What is the solid content of a round tree 25 feet long, and girt in the middle 45 inches? *Ans.* 21 ft. 11 in. 8 sec. 9 frths.

395. How much timber in a round tree 30 feet long, and the girt 42 inches? *Ans.* 22 ft. 11 in. 7 sec. 6 ths.

PROBLEM.

A more accurate way is to multiply the square of one-fifth of the girt by twice the length for the solidity.

396. If the length of a tree is 24 feet, and the girt 8 feet, what is the content? *Ans.* 122.88 feet.

397. The girts of a tree in five different places are 9.43 feet, 7.92 feet, 6.15 feet, 4.74 feet, and 3.16 feet, and the length of it 17½ feet, what is the soildity? *Ans.* 54.424992 feet.

NOTE. Take care to point off your decimal parts.

25 is the decimal of ¼,
50 is the decimal of ½, and
75 is the decimal of ¾ of any thing.

PROBLEM.

Superficial Measure.

Multiply the length in feet, by the breadth in inches, which product divide by twelve, and you will have the superficial (or square feet required: the remainder, is inches.

Example.

398. A plank or board $24\frac{1}{2}$ feet long, by 13 inches broad, required the superficial content?

Operation.

$24\frac{1}{2}$ Feet long.
13 Inches broad.

12)318$\frac{1}{2}$

26.6$\frac{1}{2}$ Inches Superficial, and so of any other.

Length. F.	Breadth. I.	Content. SQUARE FT.	Length. F.	Breadth. I.	Content. SQUARE FT.
11	18	21	9$\frac{3}{4}$	13$\frac{1}{4}$	10 9′ 2″ 3‴
9	17$\frac{1}{4}$	13 1′ 6″	8$\frac{1}{2}$	22	15 1′ 6″
11$\frac{1}{2}$	7$\frac{3}{4}$	7 3′ 2″ 3‴	14$\frac{1}{2}$	20	24 2′

PROBLEM.

Unequal-Sided Timber.

TO FIND THE CONTENT THIS IS THE RULE. Multiply breadth and thickness together in inches and half inches, and that product by the length in feet, which when done, divide by one hundred and forty-four, cutting off so many decimal figures as there are in the operation, and the content will appear in solid feet; the remainder, divided by twelve, gives inches.

Example.

399. A piece of timber $26\frac{1}{2}$ feet long, $18\frac{1}{2}$ inches broad, and $14\frac{1}{2}$ inches thick, how many solid feet?

Operation.

Inches 18.5 Broad.
15.5 Thick.

2682.5
26.5 Length.

144)7108.625
144

Feet 49.4.4 Twelfths, solid feet.

Breadth I.	Depth or thickness in inches	Length. FT.	Content SOLID FT.	Breadth I.	Depth or thickness in inches.	Length. FT.	Content SOLID FT.
32	18	14$\frac{1}{2}$	58	19	8$\frac{3}{4}$	24	27 8′ 6″
13	10	18	16 3′	15$\frac{1}{2}$	3$\frac{1}{4}$	16	5 7′ 2″
14	11$\frac{1}{2}$	9	10 0′ 9″	11	9	16	11

PROBLEM.

To find the content of Triangular Timber.

THIS IS THE RULE. Multiply base by the perpendicular in inches and half that product by the length in feet, which when done, divide by one hundred and forty-four, gives the number of solid feet contained. Divide the remainder by twelve for the inches.

Example.

400. A piece of timber, whose sides are triangular, viz., the base 26 inches, perpendicular $17\frac{1}{2}$ inches, and the length 12 feet, how many solid feet contained?

Inches 26 Base.
$17\frac{1}{2}$ Perpendicular.
455 Product.
$227\frac{1}{2}$ Half the product.
12 Length.
144)2730
Feet 18.11 Inches, six-twelfths, solid. *Ans.*

PROBLEM.

Mahogany.

TO FIND THE CONTENT, THIS IS THE RULE.—Multiply breadth by depth in inches, and that product by the length in feet, which last product divide by 12, gives the superficial inch feet required.

Example.

401. A mohogany log $25\frac{1}{2}$ inches broad, 16 inches thick, and $15\frac{1}{2}$ feet long, how many superficial inch feet?

Operation.

$25\frac{1}{2}$ Inches broad.
16 Thick
408
$15\frac{1}{2}$ In length.
12)6324
527 Inch feet.

PROBLEM.

Sawyers' Work, measured with a line.

Measure off your several cuts alternately with a line, which afterwards measure on the Rule.

THIS IS THE RULE. Multiply the line by length in feet and inches, and you will have the product required.

Example.

402. Admit 34 feet, 6 inches line, by 9½ feet long.

Operation.

	Ft. In.
Line	34.6
Long	9.6
	310.6
	17.3
Feet of Sawing	327.9 *Ans.*

Carpenters' Work.

Roofing and flooring are measured by the square of ten feet each way, one hundred square feet being one square of work.

TO FIND THE CONTENT, THIS IS THE RULE. Multiply the given dimensions together in feet and inches, which product divide by one hundred (by cutting off the figures to the right), will give the squares required.

Examples.

403. A piece of work, 96 feet, 3 inches, by 21 feet, 3 inches, required the number of squares contained therein?

Operation.

Ft. 96.3 inches.
21.3

100÷20.45.3 9 *Ans.* 20 squares, 45 feet, 3¾ inches.

404. A piece of work 14 feet 6 inches, by 10 feet 3 inches, required the square yards contained.

14.6
10.3
140.
5
3.6
1.6
9÷148.7.6 in.
Yds. 16.4.7.6 pts., or 16½ yds.

Specific Gravity.

Specific Gravity is the relative weight of any body of a certain bulk, compared with the weight of some body taken as a standard of the same bulk. The standard of comparison is water; one cubic foot weighs 1000 ounces Avoirdupois, at a temperature of 60 Fahrenheit.

Of Wood.

	Specific Gravity.		Specific Gravity.
Cork	246	Maple and Riga Fir	750
Poplar	383	Ash and Dantzic Oak	760
Larch	544	Yew, Dutch	788
Elm and English Fir	556	Apple Tree	793
Mahogany, Honduras	560	Alder	800
Willow	585	Yew, Spanish	807
Cedar	596	Mahogany, Spanish	852
Pitch Pine	560	Oak, American	872
Pear Tree	661	Boxwood, French	912
Walnut	671	Logwood	913
Fir, Forest	694	Oak, English	970
Beech	696	Do. 60 years cut	1170
Cherry Tree	715	Ebony	1331
Teak	745	Lignumvitæ	1333

PROBLEM.

To find the magnitude of a body from its weight.

RULE. Weight of the body in ounces divided by its specific gravity in table=content in cubic feet.

Examples.

405. How many cubic feet are in one ton of mahogany?

20 cwt. = 112 lb. = 35840 ounces in a ton;

Look to mahogany, and opposite you will find 560, which divide into the ounces of a ton and it will stand thus:

560)35840(64 cubic feet. *Ans.*
224

Had the timber been fir; look to fir and you will find 556 which divide into the ounces in a ton, thus:

556)35840 ounces(64.46 cubic feet.

Or English oak:

970)35840(36.94 cubic feet.

PROBLEM.

To find the weight of a body from its bulk.

RULE. Cubic feet × specific gravity = weight in ounces.

Example.

406. What is the weight of a log of larch, 14 feet long, $2\frac{1}{2}$ broad, and $\frac{1}{4}$ thick?

$2.5 \times 1.25 \times 14 = 43.75$: then

$43.75 \times 544 = 23800$ ounces = 13 cwt. 1 qr. 3 lbs. 8 oz.

BRICKLAYERS' WORK.

The chief part whereof is measured by the perch, being twenty-one feet long, nine inches thick, and one foot high.

TO CALCULATE, THIS IS THE RULE. Multiply length by height, in feet and inches, and that product by the inches in thickness, which last product divide by nine, and that quotient by twenty-one, will give the perches sought, standard measure; but when the thickness is nine inches only, multiply the given length and heighth together, and divide by twenty-one for perches.

Example.

407. A piece of work 66 feet long, 20 feet 6 inches high, and 28 inches thick, how many perches are contained therein?

Operation.

Feet 66.0 length,
20.6 heighth.

1320
33

1353
28 inches thick.

9)37884

21)4209 3

Perches 200 9ft. 3in.

In Rough Stone Work,

Twenty-one feet long, twelve inches high, and eighteen inches thick, make a perch.

Multiply in like manner as above directed; that is length and height together, in feet and inches, and the product multiply by the inches in thickness, which last product divided by 18, and that quotient by 21, gives the perches contained. But when the thickness is 18 inches only, multiply the given length and height together, and divide by 21 for perches,

One thousand of any common bricks (mortar and work) will make four perches and a quarter of work.

Two hundred and thirty-six bricks (mortar and work) will make a perch.

To find the solid content of a marble block.

THIS IS THE RULE. Multiply length by breadth in feet and inches, and that product by the depth in feet and inches, will give you the solid content in feet, by which it is sold.

N.B. Twelve solid feet of marble make a ton.

Operation.

	Ft.	In.		
Admit	6	6	Length	
by	2	4	Breadth	
	2	2	0	
	13	0	0	
	15	2	0	
	1	3	0	Thickness
	3	9	6	
	15	2	0	
	18	11	6	Or, $18\frac{3}{4}$ feet, solid content.

Slaters' Work,

Is measured by the square of one hundred square feet.

GENERAL OBSERVATIONS. No deduction for chimney shafts. Hips, valleys, and eves, added to the content of the roof as double measurement. Six hundred of double slates cover a square of work. One thousand of singles, do. One hundred and sixty five tiles, do. Forty laths will do a square of work. A ton of slates will do about a square and a quarter of work.

THE CENTRE OF OSCILLATION—THE PENDULUM, AND CENTRE OF PERCUSSION.

1. In a vibrating body the centre of oscillation is that point in the axis of vibration, in which, if the whole matter contained in the body were collected, and acted upon by the same force, it would, if attached to the same axis of motion, perform its vibrations in the same time. The centre of oscillation in the straight line which passes through the centre of gravity, and is perpendicular to the axis of motion.

2. A Simple Pendulum is a single weight, considered as a point, hanging at the lower extremity of an inflexible right line, having no weight, and suspended from a fixed point or centre, about which it vibrates, or oscillates. A Compound Pendulum, on the other hand,

consists of several weights, so connected with the centre of suspension, or motion, as to retain always the same distance from it, and from each other.

3. If the pendulum be inverted, so that the centre of oscillation shall become the centre of suspension, then the former centre of oscillation, and the pendulum will vibrate in the same time: this is called the reciprocity of the pendulum.

4. Of the Simple Pendulum it may be observed, that its length with vibrating seconds, must in the first place be determined by experiment, as it vibrates by the action of gravity—which force differs at different distances from the pole of the earth. By late experiments, the length of the seconds' pendulum in the latitude of London, has been found to be 39·1393 inches, or 3·2616 feet; the length at the Equator is nearly 39·027, and at the pole 39·197 inches. The length of the latitude of London may be taken for all places in Britain without any great difference.

5. The times of vibration of two pendulums, are directly proportional to the square roots of the lengths of these pendulums.

Examples.

What will be the time of one vibration of a pendulum of 12 inches long at London?

$\sqrt{39{\cdot}1393} : \sqrt{12} :: 1 = 05537$ time of one vibration.

If the pendulum be 36 inches long,

$\sqrt{39{\cdot}1393} : \sqrt{36} : 1 = 09599$ time of one vibration.

6. The lengths of the pendulums are to each other inversely as the squares of the numbers of vibrations made in a given time.

What is the length of a pendulum vibrating half seconds, or making 30 vibrations in a minute?

$(60)^2 : (30^2 :: 39{\cdot}1393 = 9{\cdot}7848$ length in inches.

NOTE. The length of a pendulum to make any given number of vibrations in a minute, may be easily formed by the following rule.

$$\frac{140850}{\text{Number of vibrations.}^2} = \text{length.}$$

Thus a pendulum to make 50 vibrations in a minute, will be

$$\frac{140850}{52^2} = \frac{140850}{2500} = 56{\cdot}34 \text{ inches in length.}$$

The rules for simple pendulums may be expressed as follows:—

The time of one vibration in seconds of any pendulum is=

$$\frac{1}{\text{Number of vibrations in one second,}}$$

Or $\sqrt{\frac{\text{the length of the pendulum}}{33{\cdot}1393}}$

Example.

If the number of vibrations of a pendulum be ·6256, then

$$\frac{1}{{\cdot}6256} = 1{\cdot}598 = \text{time of one vibration.}$$

Or if the length of the pendulum be 100 inches, then

$$\sqrt{\frac{100}{33{\cdot}1393\times\cdot}} = 1{\cdot}598.$$

The length of a pendulum in inches is=39·1393 × time of one vibration^2;

$$\text{Or } \frac{39{\cdot}1393\times\cdot}{\text{Number of vibrations}^2}$$

Example.

If the time of one vibration be 1·598, find the length.

$39{\cdot}1393\times 1{\cdot}598^2 = 100$ length of pendulum.

Or, if the number of vibrations in a second beats above ·6256, then we have,

$$\frac{39{\cdot}1393}{{\cdot}6256^2} = 100 \text{ length of pendulum.}$$

The number of vibrations in a second may be found thus:—

$\sqrt{\frac{39{\cdot}1393}{\text{length of pendulum.}}}$ = number of vibrations; or, the number of vibrations in a second is

$$= \frac{1}{\text{Time of one vibration.}}$$

If the time of one vibration be, as above, 1·598; then

$$\frac{1}{1{\cdot}598} = {\cdot}6256 \text{ number of vibrations;}$$

Or, if the length be 100, we have

$$\sqrt{\frac{39{\cdot}1323}{100}} = {\cdot}6255.$$

7. When the clock goes too fast or too slow, so that it shall loose or gain in twenty-four hours, it is desirable to regulate the length of

the pendulum so that it shall go right. The pendulum bob is made to move up or down on the rod, by means of a screw. If the clock goes too fast, the bob must be lowered; and if too slow, it must be raised.

THIS IS THE RULE. Multiply the time in minutes that the clock loses or gains in twenty-four hours, by the number of threads in an inch of the screw; divide this product by 37, and it will give the number of threads that the bob must be screwed up or down, to put the clock right.

Example.

If the rod have a screw 70 threads in the inch, and the pendulum is too long, so that the clock is 12 minutes slow in 24 hours; then

$$\frac{2\times 70\times 12}{37} = 45\tfrac{1}{3}\tfrac{5}{7}$$ threads we must raise the bob, to make the clock go right.

8. It is often desirable that a pendulum should vibrate seconds, and yet be much shorter than 39·1393 inches; which may be done by placing one bob on the rod above the centre of suspension, and another below it; then, having the distances of the weights from the centre of suspension, we may find the ratio which the weights should bear to each other, by the following rule. Call D the distance of the lower, and d the distance of the upper weight, from the centre of suspension; then

$$\frac{39.1393\times D - D_2}{39\cdot1393\times d + d^2}$$ = a number which, when multiplied by the lower weight will give the higher,—D and d are taken in inches.

Example.

9. In a pendulum having two bobs, the one 12 inches below the centre of suspension, and the other 9·6 inches above the same centre, the lower weight being 2 ounces, what is the upper weight?

$$\frac{39\cdot1393\times 12 - 12^2 = 0\cdot696}{39\cdot1393\times 9\cdot6 + 9\cdot6^2}$$

Then $0\cdot696\times 8 = 5\cdot568$ ounces=the weight of the upper bob.

Centre of Percussion.

1. If a common walking stick be held in the hand, and struck against a stone, at different points of its length, it will be found that the hand receives a shock when it is struck at any part of the stick, but at one particular point, at which, if the stick be struck, the hand will receive no shock—this is called the centre of percussion, and is

defined thus :—The centre of percussion is that point in a body revolving about an axis, at which, if it struck an immovable obstacle, all the motion of the body would be destroyed, so that it would incline neither way after the stroke.

2. The distance of the centre of percussion from the axis of motion, is the same as the distance of the centre of oscillation from the centre of suspension ; and the same rules serve for both centres.

3. The distance of either of these centres from the axis of motion is found thus :—

4 If the axis of motion be in in the vertex of the figure, and the motion be flatwise ; then,

5. In a right line, it is $= \frac{2}{3}$ of its length ;

In an Isosceles triangle $= \frac{3}{4}$ of its height ;

In a circle $= \frac{5}{4}$ of its radius ;

In a parabold $= \frac{5}{7}$ of its height.

6. But if the bodies move sidewise, we have it in a circle$=\frac{3}{4}$ of the diameter.

In a rectangle suspended by one angle$=\frac{3}{4}$ of the diagonal.

7. In a parabold suspended by its vertex$=\frac{5}{7}$axis$+\frac{1}{3}$ parameter ; but if suspended by the middle of its base$=\frac{4}{7}$axis$+\frac{1}{2}$ parameter.

8. In the sector of a circle$=\dfrac{3\times\text{arc}\times\text{radius.}}{5\times\text{chord.}}$

9. In a cone$=\frac{4}{5}$axis$+\dfrac{\text{radius of base}^2}{5\times\text{axis.}}$

Illustration by Example.

What must be the length of a rod without a weight, so that when hung by one end it shall vibrate seconds ?

To vibrate seconds, the centre of oscillation must be 39·1393 inches from that of suspension ; hence, as this must be $\frac{2}{3}$ of the rod, 2 : 3 :: 39·1393 = 58·7089 inches, the length of the rod.

What is the centre of percussion of a rod 46 inches long ?

$\frac{2}{3}\times 46 = 30\frac{2}{3}$ inches from the axis of motion.

In an isosceles triangle, suspended by one angle, and oscillating flatwise, the height is 24 feet, what is the distance of the centre of percussion from the axis of motion ?

$\frac{3}{4}\times 24 = 18$ feet.

In a sphere the diameter is 14, and the string by which the sphere is suspended is 20 inches; therefore,

$$\frac{2\times 72}{5\,(20+7)}+7+20=\frac{9\,8}{1\,3\,5}+27=27{\cdot}725;$$

So that the centre of oscillation or percussion is farther from the axis of motion than the centre of the sphere, by 7·725 inches.

EXCHANGE.

With Denmark and Norway.

Exchange by the Rix Dollar, value 4s. 6d. sterling, but the course of Exchange varies from 45 to 58d. sterling.

			s.	d.
6 Skillings	= 1 Duggan	=	0	$3\frac{3}{8}$
16 Skillings	= 1 Marc	=	0	9
20 Skillings	= 1 Rix Marc	=	0	$11\frac{1}{4}$
24 Skillings	= 1 Rix Ort	=	1	$1\frac{1}{2}$
4 Marcs	= 1 Crown	=	3	0
6 Marcs	= 1 Rix Dollar	=	4	6
11 Marcs	= 1 Ducat	=	8	3
14 Marcs	= 1 Hatt Ducat	=	10	6

With Sweden and Lapland.

Exchange by the Copper Dollar, value $6\frac{2}{9}$d.; but subject to great variations. A Runstic=$\frac{7}{36}$d. sterling.

		s.	d.
2 Runstics	= 1 Stiver	= 0	$0\frac{7}{18}$
4 Stivers	= 1 Cop Marc	= 0	$1\frac{5}{9}$
3 Cop Marcs	= 1 Silver Marc	= 0	$4\frac{1}{2}$
4 Cop Marcs	= 1 Cop Dollar	= 0	$6\frac{2}{9}$
3 Silver Marcs	= 1 Carolina	= 1	2
3 Cop Dollars	= 1 Silver Dollar	= 1	$6\frac{2}{3}$
3 Silvar Dollars	= 1 Rix Dollar	= 4	8
2 Rix Dollars	= 1 Ducat	= 9	4

With Russia and its Dependencies.

Exchange by the Ruble, value 4s. 6d., but varies from 4 to 5s. sterling.

		s.	D.
2 Poluscas	1 Denusca	= 0	$0\frac{27}{100}$
2 Denuscas	1 Copec	= 0	$0\frac{27}{50}$
3 Copecs	1 Altin	= 0	$1\frac{31}{50}$
10 Copecs	1 Grevena	= 0	$5\frac{2}{5}$
25 Copecs	1 Polpoletin	= 1	$1\frac{1}{2}$
2 Polpoletins	1 Poltin	= 2	3
2 Poltins	1 Ruble	= 4	6
2 Rubles	1 Ducat	= 9	0

With Livonia, a Russian Province—Riga, Revel, Narva, &c.

		s.	D
6 Blackens	1 Grosh	= 0	$0\frac{7}{15}$
9 Blackens	1 Vording	= 0	$0\frac{7}{10}$
2 Groshes	1 Whiten	= 0	$0\frac{14}{15}$
3 Whitens	1 Marc	= 0	$2\frac{4}{5}$
5 Marcs	1 Floren	= 1	2
3 Florens	1 Rix Dollar	= 3	6
18 Marcs	1 Albertus	= 4	$2\frac{2}{5}$
64 Whiten	1 Cop Pl. Dollar	= 4	$11\frac{11}{25}$

With Prussia and Poland.

Exchange by the Grosh, value $\frac{7}{15}$d. sterling, by way of Hamburgh; 270 Grosh being=to 1 pound Flemish, and 110 Grosh =to 1 Rix Dollar, Bank of Hamburg.

		s.	D.
3 Skelons	1 Grosh	= 0	$0\frac{7}{15}$
5 Groshen	1 Coustic	= 0	$2\frac{1}{2}$
3 Coustics	1 Tinse	= 0	7
18 Groshen	1 Ort	= 0	$8\frac{2}{5}$
2 Tinses	1 Florin	= 1	2
3 Florins	1 Rix Dollar	= 3	6
8 Florins	1 Ducat	= 9	4
5 Rix Dollars	1 Fred-d'or	= 17	6

With Germany.

At Hamburgh and Altona, they Exchange by the pounds Flemish, or give an uncertain number of Shillings and Grots for the Pound sterling. At Francfort, by the Gould, Guildar or Rix Dollar

			s.	d.
3 Fennings	1 Dreyling	=	0	$0\frac{9}{32}$
2 Dreylings	1 Grot	=	0	$0\frac{9}{16}$
12 Fennings	1 Shil. Lub.	=	0	$0\frac{1}{8}$
16 Shil. Lub.	1 Marc	=	1	6
3 Marcs	1 Rix Dollar	=	4	6
6 Marcs	1 Danish Ducat	=	9	0
12 Grots	1 Sol Gros	=	0	$6\frac{3}{4}$

20 Sols - 1 Pound
$7\frac{1}{2}$ Marcs - 1 Pound
A Grot is a Penny Flemish

With Francfort, Wurtsburg, Nuremberg, &c.

			s.	d.
4 Fennings	1 Crutzer	=	0	$0\frac{7}{15}$
3 Crutzers	1 Keyser Gros	=	0	$1\frac{2}{5}$
15 Crutzers	1 Ort Gould	=	0	7
4 Orts Gold	1 Gould	=	2	4
6 Orts Gold	1 Rix Dollar	=	3	6
2 Goulds	1 Hard Dollar	=	4	8
2 Hard Dollars	1 Ducat	=	9	4
A Batzen	is	=	0	$1\frac{13}{15}$

With Holland and the Netherlands.

Exchange by the Pound Flemish, from 30 to 35s. Flemish for the Pound sterling.

			s.	d.
8 Pennings	1 Groot	=	0	$0\frac{21}{40}$
2 Groots	1 Stiver	=	0	$1\frac{1}{20}$
6 Stivers	1 Scalin	=	0	$6\frac{3}{10}$
20 Stivers	1 Guilder	=	1	9

2½ Guilders	-	-	-	1 Rix Dollar	-	-	=	4	4½
6 Guilders	-	-	-	1 Pound	-	-	=	10	6
4 Pennings	-	-	-	1 Urche	-	-	=	0	$0\frac{9}{40}$

Moeda = £1. 7s.

With the French.

Exchange by the Franc, value $10\frac{1}{8}$d.

					£	s.	d.
3 Deniers	-	-	-	1 Liard -	=	0	$0\frac{1}{8}$
2 Liards	-	-	-	1 Dardene -	=	0	$0\frac{1}{4}$
2 Dardenes	-	-	-	1 Sol -	=	0	$0\frac{1}{2}$
20 Sols	-	-	-	1 Livre -	=	0	10
3 Livres	-	-	-	1 Ecu Exchange	=	0	2 6
10 Livres	-	-	-	1 Pistole -	=	0	8 4
24 Livres	-	-	-	1 Louis-d'or -	=	1	0 0
1 Centime	-	-	-	- -	=	0	$0\frac{81}{800}$
10 Centimes	-	-	-	1 Decime	=	0	$1\frac{1}{80}$
10 Decimes	-	-	-	1 Franc -	=	0	$10\frac{1}{8}$
80 Francs	-	-	-	81 Livres -	=	0	$10\frac{1}{8}$

With Spain

Exchange by the Piaster, from 38 to 42d. sterling, but there is a great difference between the real money, and government paper.

					s.	d.
2 Marvadies	-	-	-	1 Quartil -	=	0	$0\frac{43}{136}$
17 Quartils	-	-	-	1 Rial - -	=	0	$5\frac{3}{8}$
2 Rials	-	-	-	1 Pistarine -	=	0	$10\frac{3}{4}$
4 Pistarines	-	-	-	1 Piaster Ex.	=	3	7
10 Rials	-	-	-	1 Dollar -	=	4	6
4 Piasters	-	-	-	1 Pistole Ex.	=	14	4
36 Rials	-	-	-	1 Pistole -	=	16	9
16 Marvadies	-	-	-	1 Soldo -	=	0	$3\frac{7}{8}$

With Portugal.

Exchange by the Mileria, from 5s. to 5s. 7½d per.

			£	s.	d.
20 Rez	1 Vintin	=	0	0	$1\frac{7}{20}$
5 Vintins	1 Testoon	=	0	0	$6\frac{3}{4}$
4 Testoons	1 Crusado	=	0	2	3
1000 Reas	1 Milrea	=	0	5	$7\frac{1}{2}$
48 Testoons	1 Moidore	=	1	7	0
64 Testoons	1 Joanese	=	1	16	0

With Italy.

Exchange by the Pezzo, value 4s. $1\frac{9}{20}$d.

			s.	d.
12 Denari	1 Soldi	=	0	$0\frac{43}{100}$
20 Soldi	1 Lire	=	0	$8\frac{3}{5}$
5 Lires	1 Croisado	=	3	7
115 Soldi	1 Pezzo of Ex.	=	4	$1\frac{9}{20}$
$7\frac{1}{2}$ Lires	1 Ducat	=	5	$2\frac{1}{2}$
22 Lires	1 Pistole	=	17	0

A Chequin = 9 0
A Julio = 0 6
A Bayoc = 0 $0\frac{3}{4}$

With Sicily.

10 Grains make 1 Carlin
2 Carlins —— 1 Tarin
30 Tarins (600 grs.) —— 1 Onza, value 7s. 8d.
2 Onzas or Ounces are 5 Crowns (Seudos)
240 Grains — 1 Crown value, 3s. $0\frac{4}{5}$d.

With Greece, Candia, Cyprus, &c.

			s.	d.
4 Mangars	-	1 Asper	= 0	$0\frac{3}{5}$
3 Aspers	-	1 Parac	= 0	$1\frac{4}{5}$
5 Aspers	-	1 Bestic	= 0	3
2 Bestics	-	1 Ostic	= 0	6
2 Ostics	-	1 Solota	= 1	0
4 Solotas	-	1 Piastre	= 4	0
5 Solotas	-	1 Caragrouch	= 5	0
2 Caragrouches	-	1 Xeriff	=10	0

With Arabia and Persia.

		£.	s.	d.			£.	s.	d.
Larin	=	0	0	$0\frac{1}{2}$	7 Carrets or 1 Cumashee	=	0	0	$0\frac{9}{10}$
Abyss	=	0	1	$4\frac{8}{5}$	Bisti	=	0	0	$1\frac{3}{8}$
Sequin	=	0	7	6	Bovello	=	0	16	0
Shahee	=	0	0	4	Rupee	=	0	2	6
Mamooda	=	0	0	8	Pagoda	=	0	8	9
Tomond	=	3	7	6	Viz	=	0	0	$2\frac{11}{32}$
Coz	=	0	0	$0\frac{2}{5}$					

With the East Indies.

		£.	s.	d.			£.	s.	d.
Budgrook	=	0	0	$1\frac{27}{800}$	Bassaraco	=	0	0	$0\frac{27}{200}$
Laree	=	0	0	$5\frac{2}{5}$	Peca	=	0	0	$0\frac{27}{100}$
Quarter	=	0	0	$6\frac{3}{4}$	Vintin	=	0	0	$1\frac{7}{216}$
Xeraphim	=	0	1	$4\frac{1}{5}$	Tangu	=	0	4	6
A Re	=	0	0	$0\frac{27}{400}$	Paru	=	0	18	0
Rupee	=	0	2	3	Viz	=	0	0	$0\frac{5}{80}$
Pagoda	=	0	8	0	Fanam	=	0	0	3
Gold Rupee	=	1	15	0	Fiano	=	0	6	1

With China.

		£.	s.	d.			£.	s.	d.
Caxa	=	0	0	$0\frac{2}{25}$	Rupee	=	0	2	6
Candareen	=	0	0	$0\frac{4}{5}$	Dollar	=	0	4	6
Mace	=	0	0	8	Crown	=	0	5	0

With the United States of America.

		£.	s.	d.
100 Cents - - - - 1 Dollar - - -	=	0	4	6
10 Dollars - - - - 1 Eagle - - -	=	2	5	0

Also, $\frac{1}{2}$ and $\frac{1}{4}$ Eagles.

RULE FOR ASCERTAINING THE WEIGHT OF CATTLE.

Measure the girth of the animal in feet and inches close behind the shoulder, and length in a straight line extending from the fore part of the shoulder blade to the root of the tail, so as to plumb with the hind part of the buttock; then multiply the square of the girth by five times the length, and divide the product by 21, and the quotient will be the weight of the four quarters of the animal in stones of 14 pounds imperial. If the animal be prime fat, one-twentieth of the above result may be added, and if it be under ordinary fatness, deduct one-twentieth.

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